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Hon. Editors: Wm. HAM, F.R.E.S. and BERNARD C. COTTON.

The Author of each article is responsible for the facts and opinions recorded.

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EXCURSIONS.

December 8—Mr. Burdett's, of Basket Range. Motor at 1.45 p.m. Native Flora. Mr. E. H. Ising.

December 15—Outer Harbour. Train at 1.35 p.m. Malacology. Mr. B. C. Cotton.

February 9—Blackwood. Train at 1.15 p.m. Experimental Orchard. Mr. W. J. Kimber.

February 23—Mr. Geisler's Home. Tram at 2 p.m. Aquarium. Mr. B. B. Beck.

March 2—Port Noarlunga. Motor at 1.45 p.m., 3/-. Fossils. Mr. H. A. Gunter.

March 16—Mount Lofty. Train at 1.15 p.m. Flower Show. Mr. A. J. Morison.

March 25—To be arranged. Tram at 2 p.m. Pond Life. Mr. A. G. Edquist.

EVENING MEETINGS.

February 19—To be announced. Dr. C. Fenner.

March 19—"Peopling of the Australian Region," Mr. N. B. Tindale.

MALACOLOGICAL SOCIETY.

EVENING MEETINGS.

December 3—Annual Meeting. Cerithiidae (continued).

February 4—Liotiidae.

February 18—Mr. R. C. Edwards.

March 4—Rissoidae.

March 18—Mr. F. Trigg.

The
South Australian Naturalist.

Vol. XVI. ADELAIDE, DECEMBER 15th, 1934. No. 1.

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).

(*By* BERNARD C. COTTON & F. K. GODFREY).

PART XIII.

TROCHIDAE (Contd.)

Austrocochlea Fischer 1885. Turbinate-conic, heavy, thick, solid; columella rather strong, only slightly toothed at base, not notched; aperture as high as wide; outer lip lirate within. Type —*Monodonta constricta* Lamarck. This genus differs from *Monodonta* Lamarck, in having the columella only slightly toothed, and in the absence of a square notch or channel between the columellar tooth and the basal margin. Restricted to Australia and Tasmania. We place in this genus s. str. *A. torri* and *A. zebra.*

Fractarmilla Finlay 1926 (subgenus). Shell globose-conical, solid, imperforate, surface dull corroded; obsoletely spirally cingulate, apex eroded; base flat; aperture oblique, nacreous, smooth within; outer lip convex, sharp, bordered by a narrow yellow or white, followed by a black strip; columella oblique, short, nearly straight, with one or two tubercles, white, dilated upon the parietal wall, but not extending to the upper lip; umbilical tract slightly pitted, subconcave, no pearly band. Type—*Labio corrosa* Adams, from New Zealand. Here may be placed the South Australian *A. concamerata* Wood and *A. rudis* Gray.

Chlorodiloma Pilsbry 1889 (Subgenus). Depressed conic; coloration variegated; fine lines of dark on a lighter ground; columella generally green; aperture large, very oblique; columella not prominent, flattened, not cylindrical, generally concave, arcuate, and slightly denticulate at base or smooth; umbilicus perforate or subperforate. Type—*Trochus crinitus* Philippi 1848. Here may be placed *A. adelaidae, A. odontis, A. zeus.*

A. torri sp. nov. Pl. 1, fig. 1 (not *A. constricta* Lamarck, from eastern Australia). "Torr's Austrocochlea." Shell conic, turbinate, imperforate, thick, solid; dull gray or whitish, obscurely and irregularly marked with zigzag axial stripes but generally

unicoloured; protoconch usually somewhat eroded, fairly acute; whorls four to five, slightly convex, and usually somewhat eroded, the whole uniformly weakly spirally ribbed with seven or less ribs on the body whorl; aperture oblique, outer lip thick, lirate, black margined within; columella short, slightly oblique, weakly dentate at the base with frequently two denticles in the adult, but often the two fuse forming one denticle. Height 32, diam. 28 mm. Type locality—Gulf St. Vincent (South Australia). Reg. No. D 11289 S.A. Mus. Very common, general, on exposed rocks, South Australia; less common in Western Australia. This species is easily distinguished from the eastern Australian *A. constricta* Lamarck, by its much less coarse sculpture, the type illustrated shows the maximum development of the spiral ribs seen in Flindersian specimens. The present species is also much smaller than *A. constricta* and more solid. Eastern Tasmanian specimens of *A. constricta* average one-third larger in size, having elevated keels and are much thinner than *A. torri.* Distinguished from *A. zebra* Menke, by the coloration, the slightly more valid and separated ribs, which are noticeably close on the base of *A. zebra* which is also smaller.

A. zebra Menke 1829 (*Monodonta*) (not *A. obtusa* Dillwyn 1817, a common Sydney shell: not *Trochus zebra* Wood: = *Labio porcatus* A. Adams 1851). Pl. 1, fig. 2. "The Striped Austrocochlea." Imperforate, thick, solid, lustreless; whitish or covered with a thin greenish-yellow cuticle, indistinctly longitudinally striped with black or dull red, the stripes sometimes zigzag; spire conic, acute; whorls six to seven, convex, obliquely striated and weakly spirally ridged; four to five ridges on the penultimate, eight to twelve on last whorl not so prominent as in *A. torri* or *A. constricta*, and closer, especially upon the base; aperture as in *A. torri* and *A. constricta*; outer lip lirate or smooth within; columella bearing an inconspicuous blunt tubercle near base. Height 25-34, diam. 22-25 mm. Common on rocks between tide marks, South Australia and Western Australia. (Type locality—South Australian Coasts). *A. zebra* is distinguished from *A. torri* by the more numerous, less salient spiral ridges, and by the colour pattern of dull red or black stripes alternating with white; the cuticle is usually rubbed off in adults, causing the underlying white to replace the yellow, and intense black the red, of fresh shells. There is a dwarfed variety from the border of the mangrove swamps which can bear the varietal name *porcata* A. Adams. It is more elongated than typical *zebra*, aperture less dilated, columellar tubercle obsolete. Many collectors have their examples of *zebra* Menke, labelled *obtusa* Dillwyn, which is a New South Wales shell and thicker, heavier,

much larger altogether and with different markings. *A. obtusa* Dillwyn 1817, is described as slightly conical, with spire remarkably flattened and whorls marginated; base convex, with aperture roundish, and throat lead-coloured; shell coloured with alternate longitudinal undulated purple and white stripes. Height 18, diam. 20 mm. (Type locality—(?) East Indian Seas). Hedley 1917, published a full description of the animal of *obtusa* from N.S.W. specimens, which we copy for the benefit of students who have at hand living examples of our own *zebra* for comparison, more especially as we would not be surprised to find *obtusa* in the coastal stretch from Robe to the Victorian border. Hedley writes:—"The animal of *obtusa* is splendidly arrayed in black and gold; the edge of the muzzle is buff, followed by, first, a band of black and then one of orange, the forehead-flaps are edged with orange, the ocular tentacles are orange below and black above, and the cervical epipodium is orange, the rest of the upper surface being black; the epipodium is differentiated into an anterior, median, and posterior portions; the latter begins just above the tail and continues a little past the operculum; it has a simple expanded margin, from beneath which spring four pairs of lash-tentacles, three of which are beside the operculum, and the fourth is planted where the cervical meets the posterior epipodium; at the base of each is set a stump-tentacle, forming an uneven pair like the ocular and cephalic tentacles; the three hinder tentacles are each adnate to their associate stumps, but the anterior lash is parted from its stump, while a stump without a lash stands in the median line behind the operculum; another lonely stump is the cervical papilla, which occurs on both right and left sides; the medium epipodium or cervical lobe extends from the ocular tentacle to the anterior lash; on the right it has a plain edge and during locomotion is curled into a makeshift siphon and extruded beyond the lip of the shell; on the left, the edge is cut up into about twenty filaments; the ocular tentacles are compressed from above to below and keeled laterally, thus indicating that they are over-run by the epipodium, which finds its anterior expression in a pair of forehead-flaps on the snout; even when the animal has withdrawn into the shell, the epipodial lashes steal out from behind the operculum and softly search."

A. concamerata Wood 1828 (*Trochus*) (= *Trochus striolatus* Quoy & Gaimard 1834: = *T. fuligineus* A. Adams 1851: = *T. viridis* Wood). Pl. 1, fig. 3. "Austrocochlea Grouped-in-hiding." From its gregarious habit under rocks. Imperforate, globose-conic, generally rather depressed, very thick, solid; yellow and black, tessellated or longitudinally striped, sometimes the

yellow predominating; spire very short, conic, apex usually perfect and acute, often ruddy; whorls five, slightly convex, very rapidly increasing, spirally strongly costate, thirteen or fourteen ridges on the last whorl; body-whorl slightly descending at the aperture, not eroded at the base; aperture large, oblique; outer lip margined within with yellow and black, followed by a nacreous and then by an opaque white thickening which more or less contracts the aperture and which is more or less notched at about the place of the periphery; columella white, bidenticulate below. Height 20-22, diam. 23-25 mm. Rather common, gregarious under rocks between tide marks, South Australia and Western Australia. Very common in Tasmania and Victoria. (Type locality—South Australian and Tasmanian coasts). The more prominent characters are the strong spiral ribs and the thick outer layer of yellow and purplish-black, or of black veined with yellow, which usually assumes a tessellated pattern. Sometimes the black predominates to the almost entire exclusion of yellow, and specimens also occur in which the black is scarcely visible on the surface. Wood published no description of his *concamerata*, consequently the older conchologists preferred Quoy & Gaimard's *striolata*.

A. rudis Gray 1826 (*Monodonta*) (= *M. melanoloma* Menke 1843: = *Trochocochlea chloropoda* Tate 1878-79). Pl. 1, fig. 4. "The Roughened Austrocochlea." Shell much like *Austrocochlea torri* Cotton & Godfrey, but without longitudinal plications and sutural constrictions; very thick; yellowish-white or gray; surface marked with curved striae of growth, and under the lens with numerous longitudinal striae; outer lip thin; broadly bevelled on inner side, of a black colour; perlaceous interior with nine longitudinal, narrow, roundly elevated porcellanous ribs; columella white, broad, arched; under side of body whorl black. Aged examples have the elongate-turbinate shape of *A. torri*. Height 25, diam. 25 mm. On rocks below tide marks, rather common, where present. Coymbra, Point Sinclair, Wilson's Bluff. Venus Bay, Southern Yorke Peninsula, Kangaroo Island, and west coast of South Australia. Also Western Australia—King George Sound, Geraldton, Hopetoun, Bunbury, Rottnest, Ellensbrook, Yallingup, Albany. The outer lip is bordered by a narrow yellow or white, followed by a black strip; the columella is short, oblique, substraightened, white, dilated upon the parietal wall; slightly pitted at the place of the umbilicus, subconcave. Distinguished from all other S.A. species of *Austrocochlea* by the entire lack of spiral sculpture. The species resembles *Nerita melanotragus* on superficial examination, especially in life when crawling over rock surfaces. Of course, it is

seen to be quite different on closer examination. Animal like *A. concamerata*, but the under side of the foot is green, and the muzzle and upper side of foot, black.

A adelaidae Philippi 1849 (*Trochus*) (= *Gibbula depressa* Tenison-Woods 1875: = *Diloma australis* Tenison-Woods 1876). Pl. 1, fig. 5. "The Adelaide Austrocochlea." Globose conic, narrowly perforate, solid; light ash colour, longitudinally marked with numerous narrow regularly spaced olive lines, the first whorls bright orange coloured; spire conic, eroded; sutures linear, impressed; whorls five, convex, spirally grooved, grooves shallow, about five on penultimate whorl; aperture oblique, lip smooth and thickened within; columella not very thick, arcuate, white edged, without a prominent tooth below; umbilical area bright green. Height 17, diam. 18 mm. Common and general, on rocks, South Australia and Western Australia. Also common in Victoria and Tasmania. (Type locality—South Australia. We designate Marino, Gulf St. Vincent.) The common form is a dark shell with fine axial white lines crossing the spirals; they may be very close together or more or less distant and vary in their thickness greatly; the apical whorls when worn, are orange coloured. A less common form is of a purplish-red tint with dark close purplish axials also with orange apices. The young shell of the black form with dark nucleus may have a well marked peripheral white band. Specimens from Venus Bay are light gray with numerous fine axial black or chocolate continuous lines. The protoconch may be shining black throughout and continue into the black of the adult shell; if the black should flake off, it displays the golden or orange layer beneath. It may be black in the first or second or third whorls, then creamy white with rusty red or brownish oblique axial lines, close set, distant, or interlaced, or broken into spots. Protoconch is often eroded, and polished, white, orange or yellow; if not eroded the minute centre may be white, followed by black and then by orange. The species differs from *A. crinita* Philippi, from Western Australia only in lacking the tooth at the base of the columella; coloration culpture and form are identical. The umbilicus of *A. adelaidae* s sometimes closed when adult. *A. crinita* also is imperforate.

A. odontis Wood 1828 (*Trochus*). Pl. 1, fig. 6. (= *Gibbula tesserula* Tenison-Woods 1880, a juvenile from Tasmania). The Edentulate Austrocochlea." Globose-conic, more or less epressed, imperforate or very narrowly perforate; protoconch hite, eroded, the rest of the shell covered with a regular, elegant, minute reticulation formed by the intersection at right angles of two sets of obliquely descending black or bluish lines; pirally finely striate the striae becoming obsolete on last whorl,

(*Continued on Page* 6).

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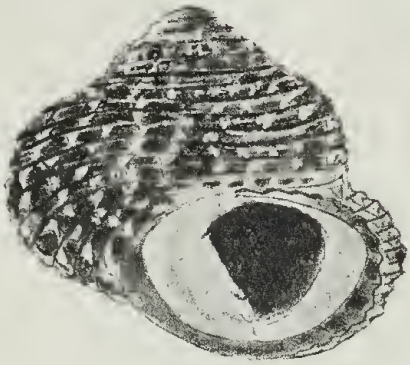

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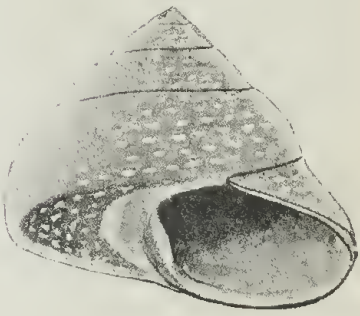

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B.C.C.

PLATE I.

EXPLANATION OF PLATE.

Fig. 1—*Austrocochlea torri* sp. nov. .... (x 1-1/4)

Fig. 2— „ *zebra* Menke .... (x 1-2/3)

Fig. 3— „ *concamerata* Wood .... (x 1-3/4)

Fig. 4— „ *rudis* Gray .... (x 1-2/5)

Fig. 5— „ *adelaidae* Philippi .... (x 2)

Fig. 6— „ *odontis* Wood .... (x 2-1/5)

growth striae microscopic, sharp; body whorl subangulate at periphery; outer lip thin, acute, inside green, beautifully iridescent; columella arcuate, not dentate, pearly edged; umbilico-columellar area vivid pea-green. Height 15, diam. 18 mm. Littoral, on short weeds in pools, not so common as the preceding, Beachport to Port Lincoln. Not recorded from Western Australia.. (Type locality—Gulf St. Vincent, South Australia). When very small the shells are umbilicate, and must not be confused with *Austrocochlea concamerata* Wood, which is constantly imperforate.

A. zeus Fischer 1874 (*Trochus*). "The Dory Austrocochlea." Imperforate, thick, obtuse; white with radiating flexuous red lines; protoconch short, papillose, yellowish; whorls four to five, moderately convex, obliquely striate, spirally sulcate, suture impressed; last whorl ample, rounded, obsoletely angulated above, marginated at the suture; base convex; aperture circular, columella subdentate at base; columellar callus thick, whitish-green; outer lip thick. Height 16, diam. 19 mm. Geraldton and Irwin River (Western Australia). We understand that this species was described by Fischer from several specimens of unknown origin, all of the same form and colour pattern. It appears to be closely allied to the South Australian *A. adelaidae* Philippi.

NOTICE.

"COMBING THE SOUTHERN SEAS."

Written by the late Sir Joseph Cooke Verco, M.D. (Lond.), F.R.C.S. (Eng.).

(Edited by Bernard C. Cotton, Conchologist S.A. Museum)

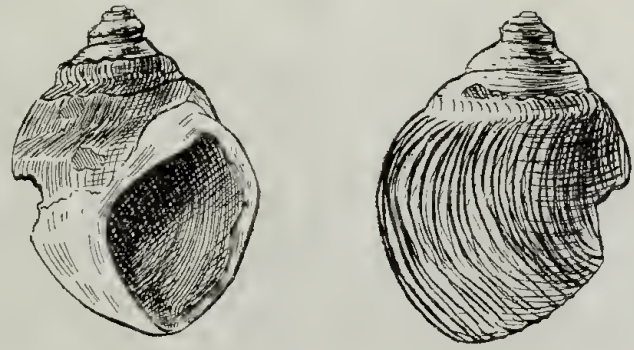
The book (now in press) describes the author's unique adventures in dredging for Marine Specimens in Southern Australian waters. Sir Joseph Verco, 20 years Hon. Conchologist at the S.A. Museum, was the first to undertake extensive scientific investigations of our Southern Australian Seas. There are numerous illustrations, including colour plate, about 125 pen and ink drawing, and half-tones. A reprint of the rare, privately published "Catalogue of Marine Mollusca of South Australia" 1908, is included. It is hoped the book will appear about December 17th.

The price is 12/6, postage 7d., and orders may be placed with the publishers, Rigby Ltd., 16, Grenfell Street, Adelaide.

A NEW SPECIES OF FOSSIL SHELL FROM THE UPPER PLIOCENE OF THE ADELAIDE PLAINS.

By Bernard C. Cotton.

Professor W. Howchin recently brought to the South Australian Museum a few fossil shells taken from a bore at Brooklyn Park, S.A. Among the specimens was a new species of *Pelicaria,* a genus having its centre of distribution in New Zealand Seas.



The Brooklyn Park bore is one of many, recently sunk, about the City of Adelaide. to provide additional water for pumping into the mains. The new species of fossil shell is described below as *Pelicaria howchini* sp. nov.

Pelicaria howchini sp. nov.

Shell ovate, spire obtuse about one sixth length of shell, whorls five, obtusely angled, suture linear; protoconch missing; sculpture smooth except for axial growth lines which become more marked towards the aperture; last whorl subquadrate, outer lip slightly inflexed in the middle; columella very concave, callous and smooth; callus spreading over the body whorl and the anterior portion of the penultimate whorl.

Holotype. Upper Pliocene. Brooklyn Park, S.A. Reg. No. D 11294, S.A. Museum.

Height 36 mm., breadth 29 mm.

Diagnosis.—The present species differs from its nearest ally *P. coronata* Tate by the more depressed spire, non-channelled suture and smooth sculpture.

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Dr. W. G. Torr, of Brighton, has kindly sent along one guinea as a gift towards the publication of the part in this issue on South Australian Shells.

XMAS GREETINGS.

The President of the Society
(Rev. H. A. Gunter)
conveys to all Members
XMAS GREETINGS and BEST WISHES for the New Year

VOL. XVI., No. 2

April 10th, 1935.

THE South Australian Naturalist

THE JOURNAL OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA AND OF THE SOUTH AUSTRALIAN AQUARIUM SOCIETY.

Hon. Editors: Wm. HAM, F.R.E.S. and BERNARD C. COTTON.

The Author of each article is responsible for the facts and opinions recorded.

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Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. E. H. Ising, Railway Station In the case of Motor Trips, ticket is to be paid for at time of booking.

EXCURSIONS.

April 6th—Largs Bay. Train 1.30 p.m. Shell Life. Mr. B. C. Cotton.
April 25th—Port Willunga. Motor, 10 a.m., 4/6. General. Mr. W. J. Kimber
May 18th—Botanical Gardens. Gate, 2 p.m. Trees. Mr. H. Greaves.
May 25th—Outer Harbour. Train, 1.35 p.m. Shells. Mr. Donaldson.
June 3rd—Montacute: Motor, 10 a.m. Geology. Mr. Wm. Ham.
June 15th—Town Hall, 2.30 p.m. Civic Museum. Mr. A. J. Morison.
June 22nd—Largs Bay. Train, 1.35 p.m. Shells. Mr. F. Trigg.

EVENING MEETINGS.

April 16th—"Orchids," Dr. Rogers. "The World of Plants at your Back Door," Rev. M. T. Winkler.
May 21st—Microscopic Evening. "Little Things that Matter," Mr. W. H. Briggs.
June 18th—"Shells." Malacological Society.

MALACOLOGICAL SOCIETY.

April 15th—Mr. Donaldson. "Collecting Shells."
May 6th—Turridae (continued). Chairman.
May 20th—Mr. H. Williams. "Barrier Reef Shells."

The
South Australian Naturalist.

Vol. XVI. ADELAIDE, APRIL 10th, 1935. No. 2.

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).

(*By* Bernard C. Cotton & F. K. Godfrey).

PART XIII.

TROCHIDAE (Contd.)

Subfamily—CALLIOSTOMATINAE.

Shell generally conical, with angular periphery; columella simple above, not folded, and either simply concave below or slightly truncate and toothed, or cylindrical, strongly plicate. Operculum thin, circular, corneous, many whorled. Distribution —All seas, from low tide mark to 500 fathoms. Fossil—Secondary. Animal having the epipodial lobes large, with three or four pairs of cirri; frontal lobes small, simple or fringed; muzzle rather large, fringed at its extremity; tentacles long, ciliiform; ocular peduncles distinct, but short; foot large, truncated in front. Radula has the central and four to five lateral teeth with irregularly oval body, and rather long pointed cusps, their outer edges serrate; marginals numerous, 30 to 50, narrow, with narrow serrate cusps.

Calliostoma Swainson 1840 (= *Zizyphinus* Gray 1840: = *Conulus* Nardo 1840: = *Lischkeia* Fischer 1880: = *Eucasta* Dall 1889). Imperforate or rarely umbilicate, conical, rather thin; whorls smooth, spirally ridged or granular, the last angled at the periphery; aperture quadrangular; columella simple, usually ending in a slight tooth at the base. Operculum thin, circular, horny, many whorled. (Type—*Trochus conulus* Linné, from the Mediterranean). The genus is found in all seas, ranging from low tide mark to 500 fathoms.

Calliostoma in the restricted sense is not found in South Australian seas. Our shells are located in the following subgenera:—

Fautor Iredale 1924 (subgenus). Iredale proposed this as a full genus for the small Austral species of *Calliostoma*, naming Z. *comptus* A. Adams from New Caledonia, as type, stating on the authority of Lt.-Col. Peile, that the radulae of the Austral species in the Gwatkin Collection, now in the British Museum, show notable differences from those of the Northern forms, the true *Calliostoma*, and also, as in the Palaeartic, the small forms are separable from the large similarly named species. An examination of the radulae in the S.A. Museum collection reveals but slight differences from true *Calliostoma*. *Fautor* is definitely of no more than subgeneric rank. Here are included the southern Australian: *allporti* Tenison-Woods, *columnarium* Hedley & May, *hedleyi* Pritchard & Gatliff, *legrandi* Tenison-Woods, *retarium* Hedley & May, *zietzi* Verco.

Spicator (subgenus nov.). Shell small, broadly conical, imperforate; sculpture of spiral lirae crossed by stout, slightly obtuse, oblique ridges; interstitial pits deep, rhombic, smooth; points of intersection of spirals and axials produced into spiniform granules; body whorl with a peripheral and subperipheral lira, the two together forming a truncated, sulcated keel. Type—*C. spinulosum* Tate from Moonta Bay, S.A. The type species is easily distinguished by its size and peculiar prickly sculpture. It does, however, recall the *C. rubropunctatum* Adams from North Australia, and that species may belong to *Spicator*.

Salsipotens Iredale 1924 (subgenus). The remarks by Iredale concerning *Fautor*, were made to apply equally to this group except that *Salsipotens* is set up for the larger species. Type—*Trochus armillatus* Wood: = *T. meyeri* Philippi. As in the case of *Fautor*, we deem this but of subgeneric rank and not a full genus as Iredale intended. Here, as well as the type which is South Australian, we include our species *rubiginosum* Valenciennes = *nobile* Philippi, *splendidum* Philippi, *ciliare* Menke and *australe* Broderip.

Sinutor (subgenus nov.). Sinistral, conical, imperforate, with spiral linear sculpture and somewhat convex base. Type—*Zizyphinus incertus* Reeve, of southern Australia and Tasmania. This subgenus is, as far as we can at present determine, monotypic. The characteristics are the sinistral form and the somewhat convex base which is obtusely angled.

C. allporti Tenison-Woods 1875 (*Zizyphinus*) (= *Trochus tinctus* Watson). Pl. 1, fig. 1. "Allport's Calliostoma." Tumidly conical, imperforate, rather solid; light translucent buff colour; dotted both on the spiral and basal cinguli with minute light chestnut spots; whorls about six, protoconch acute; adult whorls encircled by granular lirae, six on the penultimate and upper surface of last whorl, the beads distinct, rounded; base with about ten scarcely granulose concentric lirae; suture canaliculate; last whorl rounded at the periphery, slightly convex beneath; mouth obliquely quadrate, nacreous within; outer lip lirate within; bidentate below; inner lip simple. Height 11, diam. 9 mm. Rare, on shore, Guichen Bay; dredged, Beachport, Cape Wiles, Royston Head, Backstairs Passage, 17-200 fathoms. (Type locality—Islands in Bass Straits). A translucent, small, tumid shell, in habit much resembling a *Thalotia*. When immature the periphery is angular. Flindersian specimens from 100 fathoms and deeper are smaller, more delicate in form and sculpture. One from 100 fathoms off Cape Pillar is a typical deep water form.

C. columnarium Hedley & May 1908. "The Cape Pillar Calliostoma." Pl. 1, fig. 2. Rather solid, imperforate, turbinate, angled at the periphery; buff colour; three spiral keels appear on the second whorl, then increasing in number but decreasing in strength, till behind the aperture they are represented by twenty engraved spiral lines extending from the suture to the centre of the base; the spiral keels are decussated by faint oblique growth lines; whorls five-and-a-half, including a protoconch of a whorl-and-a-half, which is tilted, malleated, and concluded by a small varix; aperture oblique, rhomboidal; outer lip simple; columella thickened, insertions joined by a thin callus. Height 7.5, diam. 8 mm. Dredged in 100 fathoms off Cape Wiles. (Type locality—100 fathoms, seven miles east of Cape Pillar, Tasmania). In general appearance this resembles *C. legrandi* Tenison-Woods, but differs by blunter keel and the distant engraved spirals.

C. hedleyi Pritchard & Gatliff 1901 (not *C. ornatum* Lamarck [*Trochus*] from Port Elizabeth, South Africa). "Hedley's Calliostoma." Pl. 1, fig. 3. Conical, imperforate, apex acute; yellowish-brown, with reddish markings either in maculations or spots; whorls eight, convex, often tumid below the well defined suture; protoconch smooth; first two adult whorls trellised; following whorls with spiral, irregularly granular threads of unequal size, usually six on the antepenultimate, increasing by division of some of them to eight on the penultimate whorl and twelve on the body whorl above the periphery at the outer lip, twelve to sixteen

on the base, these latter are often spotted with red; granulations on base flattened; base convex, umbilical region narrowly impressed; aperture subrhomboidal; outer lip thin, smooth inside; columella oblique, smooth, rounded, somewhat excavately flattened at its base from within, not toothed. Height 15, diam. 14 mm. Uncommon; beach, Guichen Bay, Point Sinclair 12 x 16 mm., and St. Francis Island; also Western Australia—Hopetoun, Esperence, and Ellensbrook. Dredged—Beachport to Yankalilla Bay and Cape Borda, 9-130 fathoms. (Type locality—Dredged five to seven fathoms off Rhyll, Phillip Island, Western Port, Victoria). Has been wrongly identified as *Trochus decoratus* Philippi, which is a more acutely conical shell with flatter whorls and larger granules. The species is very variable. The colour ornament may be distinctly marked with distinct brown spots on a peripheral carina, and brown dots on the basal spirals, and axial flames on the whorls; or the shell may be uniform cinnamon brown with inconspicuous dots on the periphery, and perhaps showing in the suture. The spirals may be broad, close together, nearly flat and smooth, with a central incision as though about to divide, or they may be narrow and numerous; they may be more or less granular or tuberculate. The variations seem all to grade into one another.

C. legrandi Tenison-Woods 1876 (1875) (*Zizyphinus*). Pl. 1, fig. 4. Straightly conical, imperforate, solid, rather thick; yellowish-flesh-colour; spiral riblets, numerous, smooth, alternately larger and smaller, about eight on the penultimate whorl, about fourteen on the base; spire conic, straight; suture scarcely visible except for a slightly wider cingulus above them; whorls about six, flat, the last angular, nearly flat beneath, shortly deflexed at aperture; aperture rhomboidal, oblique, with two prominent riblets inside the upper lip, basal lip thickened, columella almost straight. Height 13, diam. 13 mm. Aperture (inside) 6 x 6 mm. Dredged—Beachport, Cape Jaffa, Cape Borda, 7 miles S.W. of Newland Head, Backstairs Passage—17 to 200 fathoms. (Type locality—Chappell Island, Bass Straits). A small smooth-ribbed form. Most examples have their sides quite straight, some have the whorls slightly concave, others slightly convex, and in one the whorls were feebly gradate. Some individuals have the brown ground colour and the spiral lirae a light purple. Flindersian deep water forms are more delicate in sculpture and formation.

C. retiarium Hedley & May 1908. Pl. 1, fig. 5. Retiarius, a gladiator furnished with a net, from a fancied resemblance of the sculpture of the shell. Conical, subperforate, with sharply keeled periphery, overlapping spire whorls and a flat base; colour uncertain; small spiral threads parted by wider interstices, seven

on the penultimate, and up to twenty on the last whorl, of these a double row compose the peripheral keel; on either side of the keel the interstices are wider than usual; irregular oblique wave-like radial folds, twenty-two on last whorl, which raise beads on the keel rows, and there cease abruptly; on base, incipient radials bead the inner spirals; whorls about six or seven; aperture oblique, trapezoidal; outer lip simple, sharply angled by the periphery; columella insertion slightly reflected over the minute umbilicus. Height 7, diam. 6 mm. Dredged, 95-100 fathoms south of Cape Wiles. (Type locality—100 fathoms, seven miles east of Cape Pillar, Tasmania.)

C. zietzi Verco 1905. Text fig. 1. Mr. Zietz was a former director of the South Australian Museum. Conic, imperforate, moderately solid; horn coloured, peripheral band white, main cinguli obscurely dotted with light chestnut, peripheral band with larger and plainer spots; whorls eight, including protoconch of one smooth turn, slightly mammillate; first two whorls rounded, next three straight sloping, last two rather convex; suture moderately deep, slightly overhung by peripheral lira; penultimate whorl with six spiral cinguli and two inter-liral threadlets; body

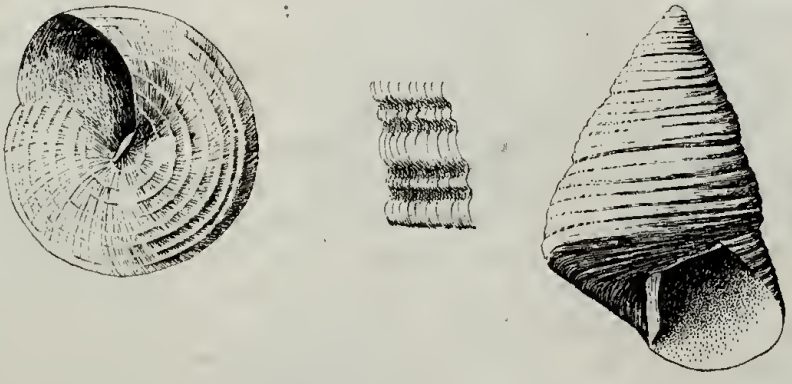
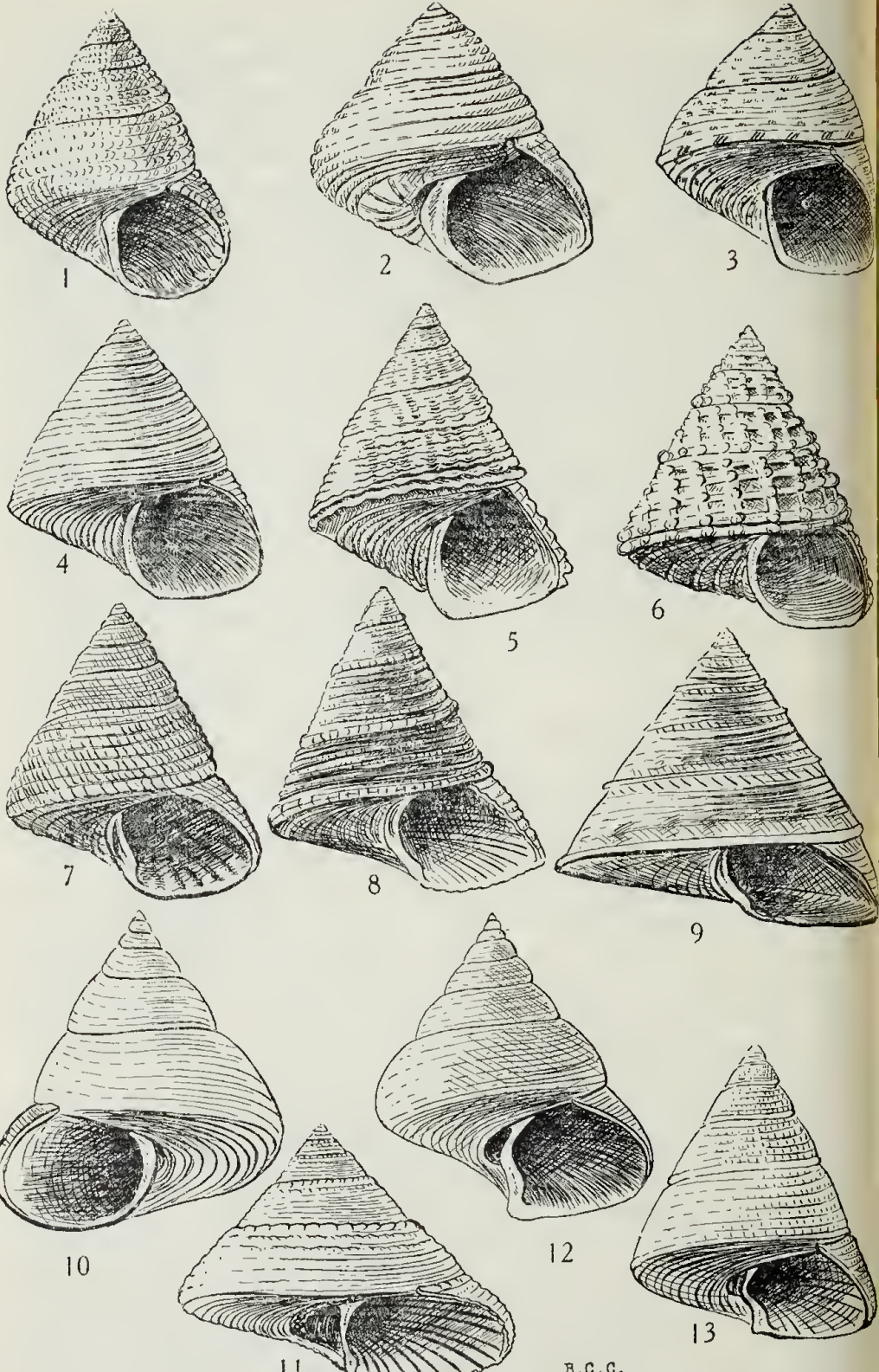


Fig. 1—*Calliostoma (Fautor) zietzi* Verco x $4\frac{3}{4}$ (Left and right). Enlarged sculpture (centre) [after Kesteven].

whorl with six cinguli, rather narrower than the interspaces and five threadlets, barely angulated below its centre by a stouter cord; base rounded, with eight concentric lirae, flat, much wider than the interspaces; spire and base finely obliquely incised with growth lines; aperture roundly quadrate; columella nearly straight, slightly oblique and excavated, subtruncate below; outer lip simple, crenulated by cinguli. Height 8, diam. 5 mm. Dredged—Backstairs Passage; Gulf St. Vincent; off Porpoise Head; S. of Funk Head; Beachport; 16—200 fathoms. (Type locality—Backstairs Passage, at 12, 17, and 20 fathoms; nine dead). Hopetoun, 35 fathoms, Western Australia.

C. spinulosum Tate 1893 (not *Zizyphinus rubropunctatus* A. Adams 1851, from North Australia). "The Prickly Calliostoma." Pl. 1, fig. 6. Broadly conical, imperforate, pale reddish-yellow with small white blotches; spiral lirae, three on the penultimate whorl, crossed by equal sized, stout, slightly obtuse, oblique ridges; interstitial pits deep, rhombic, smooth; points of intersection of spirals and oblique costae are produced into spiniform granules; spiral ridges on body whorl are increased by a slender lira interposed between the first and the second, and by a subperipheral lira nearly equal in size to the peripheral one, the two together forming a truncated sulcated keel; whorls six-and-a-half, slightly imbricating; base almost flat with about six concentric lirae, somewhat depressed, subacute, and showing a tendency to sub-granulose, crossed by strong radial growth lines. Height 5, diam. 4.5 mm. Uncommon, beach Moonta Bay, also Western Australia—Bunbury beach. Dredged, Beachport to Neptune Islands, 9-110 fathoms, also Bunbury, Western Australia, 22 fathoms. (Type locality—Moonta Bay). Trellised, and set as it were with prickles, this species resembles *C. rubropunctatum* Adams from North Australia, but differs by its sub-imbricating whorls and fewer lirae.

C. meyeri Philippi 1848 (*Trochus*) (= *T. armillatus* Wood: = *Z. armillatus* Reeve 1863: = *T. levis* Hombron & Jacquinot 1854, not *T. levis* Wood or Chemnitz: = *Z. euglyptus* Adams 1854). Pl. 1, fig. 7. "Meyer's Calliostoma." Strictly conical, carinated, imperforate, thin but rather solid; shining, pale yellowish or pinkish, with irregular, rather pale vertical bands of light yellowish-brown, often broken into maculations, and radiating on base; numerous spiral granose lirae, seven on the penultimate, the antepenultimate, and upper surface of last whorl; sometimes there are interstitial threads between the granose lirae; the flat base has twelve or thirteen concentric lirae, inner ones stronger, decidely beaded, the three or four outer more separated, less beaded; the angular periphery is formed of a double beaded ridge; spire conic, elevated with straight lateral outlines; whorls nine; protoconch subacute, smooth; the two earlier whorls following the protoconch are tri-lirate; last whorl angular at periphery, flat beneath, indented in the centre around the insertion of the columella; mouth rhomboidal, oblique, angled on the outer part, above the angle thickened inside by a heavy callus or pearly submarginal deposit; columella oblique, arcuate, slightly toothed at base. Height 36, diam. 34 mm. Not common. Port Victor, measuring 34 x 32.5, also 34 x 31 mm.; Guichen Bay, several, all with green apices and comparatively wide; also on Ocean Beach, Kangaroo Island, and St. Francis Island. Not reported



B.C.C.

PLATE I.

Fig. 1—*Calliostoma allporti* Tenison-Woods (x 3¼)

Fig. 2— „ *columnarium* Hedley & May (x 4½)

Fig. 3— „ *hedleyi* Pritchard & Gatliff (x 2½)

Fig. 4— „ *legrandi* Tenison-Woods (x 2½)

Fig. 5— „ *retiarium* Hedley & May (x 5-2/3)

Fig. 6— „ *spinulosum* Tate (x 7)

Fig. 7— „ *meyeri* Philippi (x 1)

Fig. 8— „ *rubiginosum* Valenciennes (x 1¼)

Fig. 9— „ *ciliare* Menke (x 1½)

Fig. 10— „ *incertum* Reeve (x 2½)

Fig. 11—*Astele subcarinatum* Swainson (x 1⅛)

Fig. 12— „ scitulum Adams (3)

Fig. 13— „ *multigranum* Dunker (x 3)

from Western Australia. (Type locality—unknown. We designate Port Victor, S.A.). The straightly conical form, flat base, indented around the axis, and the details of sculpture, easily separate it from allied forms.

C. rubiginosum Valenciennes (*Trochus*) (= *T. nobilis* Philippi 1846, preoccupied by Muenster 1835). Pl. 1, fig. 8. "The Rusty Calliostoma." Imperforate, acutely conical, rather thin; whitish buff, radiately flamed with brown and reddish; whorls ten, plane, protoconch eroded, smooth; adult whorls spirally cingulate, cinguli six, granose, the upper five cinguli small, lower cingulus wider, more prominent, subcrenate; last whorl acutely carinated; base, concentrically encircled by about seven or eight granose cinguli, alternately buff and rose coloured; mouth subquadrate, columellar lip spirally plicate; columella subarcuate, base subnodose, with a parallel groove. Height 22, diam. 22 mm. Dredged alive at all depths from 9-22 fathoms in Backstairs Passage, Gulf St. Vincent, Investigator Straits, and Spencer Gulf; one dead and broken shell was dredged in 150 fathoms off Beachport. Beach, uncommon, St. Francis Island. Also Western Australia—Albany beach 14.25 x 13 mm., and fragments up to 23 mm. in diameter; Geographe Bay beach 17.5 x 16 mm.; dredged, King George Sound, and off Bunbury, 12-22 fathoms. (Type locality—Western Australia. We designate King George Sound). Specimen illustrated 30 mm. x 28 mm.

C. splendidum Philippi. "The Splendid Calliostoma." Rather sharply conical, somewhat swollen; whitish, variegated and spotted throughout with orange-yellow and purple-rose; whorls convexly sloping, regularly grain-ridged throughout. Height 30, diam. 27 mm. Dredged—Gulf St. Vincent, depth uncertain (Verco MSS) and Encounter Bay. (Type locality—Australia. We designate Gulf St. Vincent). In colour this species partakes very much of the character of the preceding (*rubiginosum*), the purple-rose being more conspicuous, and broken up into blotches. The shell is of rather a lighter, more tumid growth, with the basal ridge more prominent than the rest (Reeve).

C. ciliare Menke 1843 (*Trochus*) (= *Zizyphinus castra* Reeve 1863). Pl. 1, fig. 9. Pyramidal, imperforate; fulvous, with red spots along the suture; transversely striate, decussated by very delicate striae; base plane; whorls flat, margined below, ciliate-fimbriate above; mouth ovate-lanceolate, outer lip callous-margined inside. Height 24, diam. 30 mm. Uncommon, dredged, Investigator Straits, Gulf St. Vincent, Backstairs Passage, 13-17 fathoms; also Western Australia—Swan River, Esperance, on Beach. (Type locality—North-west coast of Aus-

tralia). The shell is thin, broadly depressed, and almost without sculpture. Two examples, dredged in South Australia, are beautifully ornamented on the last three whorls with a spiral line articulated brown and white like a twisted cord, below which are crescents of brown, open forwards, also with axial flames of brown growing wider as they descend to the periphery, beyond which they extend for a short distance across the base.

C. australe Broderip 1830 (*Trochus*). "The Southern Calliostoma." Conical, granulate-cingulate; with a larger suprasutural cingulus; buff or nearly white, with spots of reddish or violaceous; whorls flat, base flat, imperforate, throat silvery. Height 25, diam. 22 mm. (Type locality—Australia). "In weed, Normanville also Hardwicke Bay, uncommon. Has the facies of a miniature *C. rubiginosum* Valenciennes" (Verco MSS). It is not represented in the British Museum.

C. incertum Reeve (*Zizyphinus*). Pl. 1, fig. 10. "The Doubtful Calliostoma." Shortly conical, sinistral, yellowish-white; spirally closely linearly ridged; whorls slopingly convex, last whorl obtusely angled at the base. Height 15, diam. 15 mm. Dredged, at several stations, Beachport to Cape Borda, 17-150 fathoms. (Type locality—Tasmania). Reeve's type, in the British Museum, is a dead shell, and South Australian examples are nearly half as large again. It appears to be a distinct species, and to be normally sinistral in its volutions.

Astele Swainson 1854. Shell nacreous, pyramidal or trochiform, profoundly umbilicate, unarmed, base convex, columella indistinct, aperture broader than high, the margin of both lips thin. Operculum large, round, corneous, multispiral, with an ovate, central nucleus. Type—*Astele subcarinatum* Swainson.

Astelena Iredale 1924 (subgenus). Apical features suggest a loosely coiled form of *Calliostoma*. Spire slender, its lateral outlines concave; last whorl rounded at the periphery and convex beneath; aperture rounded, outer and basal lips forming a half circle; columella deeply arcuate ending in an inconspicuous tubercle at base; umbilicus deep, funnel-shaped, bounded by an angle and of a different character from *Astele*. Radula of the type is easily separable from that of *subcarinatum* the type of *Astele*. Type—*Zizyphinus scitulus* A. Adams. *C. multigranum* Dunker may belong here.

Callistele (subgenus nov.). Shell conical, whorls straight sloping, spirally sculptured; suture linear; periphery acutely angular, base flatly rounded; umbilicus narrow; aperture roundly quadrate; outer lip convex, its margin sinuously convex below the suture and concave towards the periphery; basal lip convex, somewhat effuse, with callus at base partly bordering the

umbilicus and attached to the columella along a vertical groove. Operculum corneous, multispiral, nucleus central, with a radial fringe-like film over the inner portion of each spiral. Radula formula—∝. 1. 5. 1. 5. 1. ∝. Central rachidian heart-shaped, the other rachidians with trilobed cusps, a single lateral with one cusp trilobed at its base; marginals many, unicuspidate, not serrated. Genotype—*Astele calliston* Verco.

A. subcarinatum Swainson 1854 (= *Eutrochus perspectivus* A. Adams 1863:—*Zizyphinus subgranularis* Dunker 1871:—*C. adamsi* Pilsbry 1889). The Subcarinate Astele. Pl. 1, fig. 11. Shell broader than high; pale fawn colour with faint transverse waves of reddish brown; whorls above scarcely convex, marked by six to seven elevated, smooth, convex striae, which leave a flattened margined rim at the top of each whorl; body whorl beneath marked with concentric grooves which are decussated near the umbilicus; margin of body whorl slightly carinated; there is a depression between the margin and the second elevated stria on the upper surface, the first, or that next the margin being very slender; the striae on the base assume the appearance of grooves, which are wider apart as they approach the umbilicus, and the three more immediately adjoining are crossed by transverse striae which produce a granulated appearance; umbilicus interior white. Height 25, diam. 37 mm. Dredged—Beachport to Francis Island, 12—200 fathoms. Also dredged Western Australia—Hopetoun, 35 fathoms. (Type locality—Tasmania). Verco took this species alive in Gulf St. Vincent in 16½ fathoms, in mud and pieces of coralline, in association with *Surcula quoyi*. The foot is greyish white mottled with rusty brown. Its upper surface is close-lined obliquely from behind forwards with brown, and has minute white spots. The operculum is large, round, corneous, and multispiral, with an ovate central nucleus. The tentacles are of moderate length, spotted light brown and white; the eyes are at the outer and dorsal side of their extreme bases. There are four white cirri on each side projecting from the margin of the mantle and this is minutely fimbriated, except a white thin wavy lappet from just behind the eye to the first cirrus which is entire in its margin. The formula of the radula is 24. 1. (1. 4. 1. 4. 1.) 1. 24,—85 rows The marginals are long and narrow, diminishing outwardly and well serrated at the distal margin. The lateral is very large and thick and possesses two stout cusps. The most external rachidian is the largest and has a large unserrated cusp. Then follow four rachidians each with a long narrow tongue-like serrated cusp. The central has also a long narrow serrated cusp.

A. scitulum A. Adams 1854 (*Zizyphinus*). Pl. 1, fig. 12. "The Elegant Astelena." Shell small, thin, umbilicate, with slender elevated spire and broad body whorl; yellowish, obscurely

maculate with brown; whorls about seven, convex, the apical one smooth, following three or four whorls granulate, the rest densely spirally striate with light incremental lines which decussate the lirulae, especially beneath; spire slender, its lateral outlines concave, last whorl rounded at the periphery or obtusely angled, convex beneath; aperture rounded, outer and basal lips thin, forming a half circle, columella white, deeply arcuate, ending in an inconspicuous tubercle at base; umbilicus deep, funnel-shaped, bounded by an angle. Height 12, diam. 11 mm. Robe, beach, (Cotton 1934, six examples). These are the only ones we have seen from South Australia, and the specimens are apparently extra-limital, as the species is Peronian. It occurs in Victoria, and Iredale refers to it as a common Sydney shell. May did not record it in his Illustrated Index of Tasmanian Shells 1923. (Type locality—New Zealand, evidently in error, as the species is not reported from there).

A. calliston Verco 1905. Text fig. 2. Conical, thin; purple-brown, with oblique, axial, creamy, rhomboidal flames, from suture to suture; a few creamy spots on the peripheral carina; every whorl encircled by four articulated colour bands, which in the white areas are of a more opaque white than the rest of those areas, and are crossed by narrow red lines, while in the purple areas they are of a deeper purple tint, and are crossed by narrow axial white lines; base of a lighter tint, the outer six cinguli rose pink, dotted with creamy white; columella and umbilicus white, bordered outside with green, which tints the inner basal cinguli and curls around the columella into the throat; outer lip inner edge golden-brown and white, interior shining, nacreous; whorls nine including a protoconch of two smooth turns; whorls straight sloping; spiral lirae crowded, about twenty-four on the penultimate, crossed by oblique crowded growth striae; suture linear, immediately beneath the prominent

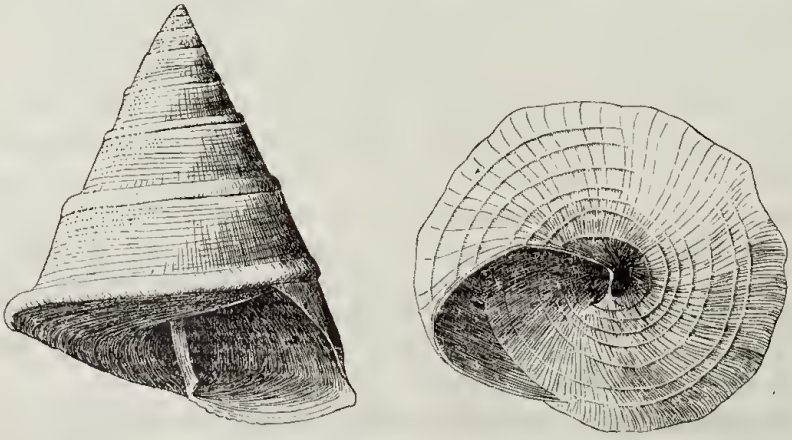


Fig. 2— *Astele* (*Callistele*) *calliston* Verco x 4 [after Kesteven].

peripheral cord which gradates the spire; periphery acutely angular, with a projecting rounded carina, spirally closely engraved on its upper surface, axially crossed by rounded striae with about sixteen rounded invalid tubercles; base flatly rounded with seven concentric narrow lirae; umbilicus narrow, faintly axially incised; aperture oblique, roundly quadrate; outer lip slightly convex, thin, smooth within, margin sinuously convex below the suture, concave towards the periphery; basal lip convex, slightly effuse, smooth within; callus at base partly bordering the umbilicus and attached to the columella along a vertical groove. Operculum horny, multispiral, nucleus central, with a radial cellular fringe-like film over the inner three-fourths of each spiral. Height 12, diam. 10 mm. Radula—∝. 1. 5. 1. 5. 1. ∝. Central rachidian heart-shaped, narrow free end surmounted by small, slightly serrated denticle; the other rachidians with trilobed cusps, which gradually enlarge outwards; a single lateral with one cusp trilobed at its base; marginals many, unicuspidate, not serrated. Dredged—Spencer Gulf, 20 fathoms, many alive and dead. (Type locality—Spencer Gulf, 20 fathoms). Colour is variable. Some are pinkish-brown, with white peripheral tubercles, and four pink cinguli on each whorl articulated with white, the larger white spots lying vertically between the supra-sutural tubercles, while narrower, oblique white spots alternate in groups with them.

A. multigranum Dunker 1871 (*Zizyphinus*). Pl. 1, fig. 13. Turreted-conic, narrowly umbilicate; light yellow; whorls eight, nearly plane, encircled by numerous unequal granuliferous riblets; sutural cingulus elevated, subundulate, spirally striate, pallidly tessellate, base a little convex, with about sixteen subgranose alternately larger and more delicate riblets; umbilicus narrow, surrounded by a white plate; columella oblique, terminating in a pearly denticle. Height 12, diam. 10 mm. Dredged—Investigator Straits; Gulf St. Vincent; Backstairs Passage; Yankalilla Bay; Western Cove; 3-22 fathoms, in weed. (Type locality—Gulf St. Vincent). In some individuals the whorls are quite flat but for the slight projection of the sutural cingulus; in others the whorls are distinctly swollen and the base more convex, so as to make the periphery more rounded. Again, in some, the later whorls have the axial striae less valid and so the spiral lirae are less granular.

Thiele, Die Fauna Sudwest Australiens 1930, p. 565, introduces *Calliostoma excellens* sp. nov. (unfigured) from Houtman Abrolhos. This appears to be a direct synonym of *C. rubiginosum* = *nobile*. A second species *Calliostoma modestum* sp. nov. (unfigured) from Sharks Bay, W.A., is probably a subspecies of *C. hedleyi*.

Genus **COLUBRARIA** Schumacher, in South Australia.

By BERNARD C. COTTON *and* F. K. GODFREY.

In the South Australian Naturalist, XIII., part 3, pp. 92, 93, 1932, we dealt with family *Fusidae*. We have since examined more material and literature and consider that a revision is necessary.

According to Thiele's diagnosis of genus *Fusus* (Handbuch der systematischen Weichtierkunde 1929 p.329), our species cannot be located there. The probable location appears to be *Colubraria* Schumacher 1817 (= *Epidromus* Morch 1852) which is placed by Thiele in family *Cymatiidae*.

We suggest the following nomenclature for South Australian species—

Colubraria reticulata A. Adams (= *Fusus mestayerae* Iredale). Beach to 200 fathoms.

C. schoutanica Hedley. 100 fathoms off Cape Wiles (Hedley).

C. bednalli Brazier 1875 (*Triton* [*Epidromus*]). "Bednall's Colubraria. Shell elongately turreted, thick, with six rather indistinct, rounded, elongated varices; eight convex whorls with regular close set longitudinal ribs and spiral striae; ribs noduled at the suture; colour when alive, dark mahogany brown, when dead, white; some from Corny Point have two spiral rows of small square brown spots on each spire whorl and four on the body whorl. Height 22, diam. 7.5 mm. Common on beaches in the South East, less common at Middleton, Corny Point, Pondolowie Beach, Spencer Gulf; and dredged to 150 fathoms. Also Western Australia—Rottnest.

One specimen in the S.A. Museum (Reg. No. D.11414) from Robe (Cotton) is sinistral. (Type locality—Guichen Bay, South Australia). A narrower species than *reticulata*.

DONATION.

Dr. W. G. Torr, of Brighton, has kindly sent along one guinea as a gift towards the publication of the part in this issue on South Australian Shells.

VOL. XVI., No. 3. July 24, 1935.

THE South Australian Naturalist

THE JOURNAL OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA AND OF THE SOUTH AUSTRALIAN AQUARIUM SOCIETY.

Hon. Editors: Wm. HAM, F.R.E.S. and BERNARD C. COTTON.

The Author of each article is responsible for the facts and opinions recorded.

CONTENTS

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Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. E H. Ising, Railway Station. In the case of Motor Trips, ticket is to be paid for at time of booking.

EXCURSIONS.

*September 7—Pt. Gawler. City Baths, 1 p.m. Birds. Mr. J. Neil McGilp.

September 14—Slape's Gully. Tram, 1.45 p.m. Botany. Mr. E. H. Ising.

September 21—Outer Harbour. Train, 1.35 p.m. Shells. Mr. B. C. Cotton.

*September 28—Hope Valley Reservoir. Motor, 2 p.m. Trees. Mr. W. A. Stow.

*October 5—Gandy's Gulley. Motor, 1.45 p.m. Foothill Flora. Mr. W. H. Selway.

*October 9—Mt. Compass. Motor, 9 a.m. Wild Flowers. Rev. H. A. Gunter.

(* Motor Trips; leave from Town Hall).

EVENING MEETINGS.

September 17—"Western Australian Flowers," Mrs. L. W. Greaves. Exhibits.

October 15—"Wild Flowers," Mr. Edwin Ashby.

November 19—"Progress of Botany in South Australia," Mr. W. Nielson; "Stars of Orion," Mr. R. C. Shinkfield.

The South Australian Naturalist.

Vol. XVI. ADELAIDE, JULY 24th, 1935. No. 3.

PROCEEDINGS.

NOVEMBER 21, 1933.

JUBILEE CELEBRATION, 1883-1933.

Rev. H. A. Gunter, President, occupied the chair and there were 87 members and friends present.

ELECTIONS.

Mrs. J. M. Moore, Messrs. J. Gilbert, A. R. Hilton, N. B. Tindale and C. A. Harris.

PROGRAMME.

The meeting was held in the Wentworth Cafe, and speeches and musical items were given with refreshments at the close. Harmony was rendered by Mrs. B. H. Kelsey, Mrs. P. Harris and Mr. R. B. Reid. The Chairman, in his opening remarks, referred to congratulations received from many other Australian kindred societies, and from representatives of the Government. Mr. W. H. Selway read a review of the 50 years, which is published in Vol. XV., No. 3 of this Journal. Mr. J. M. Black, A.L.S., President of the Royal Society, in a happy speech, extended hearty felicitations from the parent body. Messrs. G. F. Hussey, H. Dean and W. Fuller spoke of their early association with the Section, while Mr. F. W. Eardley, Registrar of the Adelaide University, congratulated the Section, on behalf of kindred societies, on attaining its Jubilee.

ORIGINAL MEMBERS STILL LIVING.

Mr. W. H. Selway, Mr. G. F. Hussey (Foundation Members with continuous membership); Messrs. W. H. Baker (F), G. Collis (F), H. Dean (F), W. Fuller (F), L. C. E. Gee, Prof. W. Howchin (F), Dr. R. H. Pulleine, Sir W. J. Sowden (F). (members who joined in 1833/34; those marked with (F) are Foundation members).

The evening proved very successful and enjoyable.

The following sent congratulations and an apology for non-attendance:—Field Naturalists' Club of Victoria; Naturalists' Society of New South Wales; South Australian Government, The Premier (Hon. R. L. Butler), Chief Secretary (Hon. G. Ritchie),

Attorney-General (Hon. S. W. Jeffries), Commissioner of Public Works (Hon. H. S. Hudd), Commissioner of Crown Lands (Hon. M. McIntosh); Rt. Hon. the Lord Mayor (Mr. J. R. Cain); Sir Wm. Sowden; Mr. R. S. Roach, and Mr. N. H. Taylor.

FEBRUARY 20, 1934.

Rev. H. A. Gunter presided at the Conversazione meeting held at the Wentworth Cafe.

NOMINATIONS.

Mrs. E. M. Masterman, Undalya; Mr. C. Boomsma, c/- Mr. Hodge, National Park, Belair; Miss F. Johns, 43 Gage St., St. Morris; Miss Pryor, Fullarton Road, Fisher Park.

ELECTIONS.

Mr. L. C. Adcock, 7 Barnard St., Nth. Adelaide; Mr. K. Beasley, Harris St., Payneham.

LANTERN LECTURE.

Mr. W. P. Lapthorne gave a very fine lecture on New Guinea illustrated by moving pictures. The subject was quite a new one and the keen appreciation of those present was expressed by Messrs. F. Trigg and E. H. Ising. Songs and duets were rendered by Mrs. H. Pank and Miss Wagner, who were accorded hearty thanks for their melody. Refreshments were served at the close.

MARCH 20, 1934.

Chair: Rev. H. A. Gunter.

ELECTIONS.

Mrs. E. M. Masterman, Mr. C. Boomsma, Miss F. Johns and Miss Pryor.

MR. E. ASHBY'S GARDEN, BLACKWOOD.

It was learned that Mr. Ashby's garden, which contains a large number of native plants, was for sale, and it was suggested that the Section move in the matter of having it purchased as a botanic garden.

LANTERN LECTURE.

Prof. T. Harvey Johnston gave an exceedingly informative lecture on "Seabirds of the Antarctic," and the pictures shown were an excellent series and wonderfully clear. Views of penguins formed a most fascinating study.

MAY 15, 1934.

Chair: Col. D. Fulton.

NOMINATIONS.

Mr. and Mrs. Adams, "Eothen," East Terrace.

LECTURE.

Mr. E. H. Ising gave a lecture on his trips to the Far North of this State and to Central Australia. Among the places visited were Oodnadatta, Pedirka, Horse Shoe Bend, Alice Springs, and Macdonnell Station, 150 miles north-east of Alice Springs. The physical features and botany were described and a large number of photographs and botanical and geological specimens were shown.

JUNE 27, 1934.

Chair: Col. D. Fulton.

ELECTION.

Mr. and Mrs. Adams.

NOMINATION.

Mr. R. Jeffries, Agricultural High School, Glen Osmond.

LANTERN LECTURE.

Dr. A. E. V. Richardson gave a splendid lecture on "Agriculture" and members were informed of the latest developments in the science which is so vital to this State.

JULY 17, 1934.

Chair: Rev. H. A. Gunter.

ELECTION.

Mr. R. Jeffries.

LANTERN LECTURE.

Dr. C. Fenner's "Rambles by Australian Rivers" showed, by means of many lantern slides, many beauty spots along our rivers, and he explained the rise and formation of different local streams. A geographical gem.

ANNUAL MEETING, AUGUST 21, 1934.

Chair: Rev. H. A. Gunter.

Reports from (1) the Secretary; (2) Treasurer and (3) Malacological Society, were given.

OFFICERS ELECTED:

Chairman, Rev. H. A. Gunter; vice-chairman, Lt.-Col. D. Fulton and Rev. M. T. Winkler; Hon. Sec., Miss J. M. Murray; asst. sec., Mr. R. C. Shinkfield; Hon. Treas., Mr. E. H. Ising; magazine sec., Mr. B. C. Cotton; librarian, Mr. R. C. Shinkfield; press correspondent, Mr. W. M. Neilson; committee, Prof. J. B. Cleland, Dr. H. K. Fry, Miss E. Ireland, Messrs. W. H. Selway, A. J. Morison, H. Greaves, A. J. Wiley, and T. J. Cun-

ningham; editors, Messrs. W. Ham and B. C. Cotton; Fauna and Flora Protection Committee, Prof. J. B. Cleland, Dr. C. Fenner, Messrs. E. Ashby, W. H. Selway, J. M. Black, F. Angel, W. Champion Hackett, B. B. Beck, J. Neil McGilp, Captain S. A. White, Lt.-Col. D. Fulton, H. M. Hale, J. R. Royle, and H. H. Finlayson.

EXHIBITS.

By Mr. H. Greaves, from Botanic Garden, fresh specimens of eight native plants in flower.

By Mr. E. H. Ising, herbarium specimens in the Goodeniaceae, viz., Calogyne, Dampiera, Goodenia, Scaevola and Velleia.

By Mr. E. A. S. Thomas, mineral ores and crystals.

By Mr. A. J. Wiley, petrified wood.

SEPTEMBER 18, 1934.

Chair: Rev. H. A. Gunter. Meeting took the form of a Conversazione and was held at Covent Gardens Cafe. The Chairman briefly outlined the work of the Section. Music was rendered by Mrs. B. H. Kelsey and Mr. and Mrs. Correll.

LANTERN LECTURE.

Col. D. Fulton gave a most interesting lecture on "Palestine during the Military Occupation by the British Forces." Over a sociable cup of tea, the members then chatted until the close at 10.30 p.m.

OCTOBER 16, 1934.

Chair: Rev. M. T. Winkler.

NOMINATIONS.

Mr. E. G. Chislett, 37 Kyre Ave., Kingswood; Miss N. Short, 9 Brooker St., Knoxville; Miss J. White, Trevelyan St., Wayville; Mr. and Mrs. H. R. Hardy, Gawler Road, Pooraka; Mr. E. French, c/- F. H. Faulding & Co., James Place, Adelaide.

PAPERS.

Mr. T. J. Cunningham read a paper on "A Pioneer Botanist Allan Cunningham," and brought to light some very interesting history of this early Australian Botanist-Explorer. Mr. R. C. Shinkfield gave an informative account of his private observatory work and revealed his enthusiasm for that science.

NOVEMBER 20, 1934.

Chair: Rev. H. A. Gunter.

ELECTIONS.

Misses N. Short and J. White, Mr. E. G. Chislett, Mr and Mrs. H. R. Hardy and Mr. E. French.

NOMINATION.

Mr. E. P. Knofel, 40 Brown St., Adelaide.

PAPERS.

"On Collecting Wild Flowers in West Australia," by Miss M. and Mr. W. Burdett. A most interesting account was given of the authors' experiences in collecting material for their garden at Basket Range.

"The South Australian Hesperidae or Skippers," by Mr. T. W. Mules. In this paper the life history of several species of butterflies was described for the first time, and it was regarded as an important contribution to this group.

FEBRUARY 19, 1935.

Chair: Rev. H. A. Gunter.

ELECTION.

Mr. E. P. Knofel.

NOMINATIONS.

Dr. H. E. Dunstone, 124 Payneham Rd., St. Peters; Rev. J. J. Stolz, Miss M. Stolz, Miss E. Stolz, all of 39 Hill Street, Nth. Adelaide; Mr. H. T. Condon, S.A. Museum, Adelaide; Mrs. W. T. Hayward, Ruthven Mansions, Pulteney St., Adelaide; and Mr. and Mrs. R. Cramond, Basket Range.

LANTERN LECTURE.

Dr. C. Fenner gave an extremely interesting lecture on "The Murray River and its Basin," and showed numerous slides which dealt with the physiography of the catchment and basin of the Darling and Murray River systems, its rainfall, ecology, industries and peoples. By means of the slides the rivers were traced from their sources, but special reference was made to the one river (the Murray) which influenced the eastern half of the continent.

BOOKLET ON NATIONAL PARK, BELAIR.

A letter was received from the Secretary, National Park, Belair, to the effect that £25 was available for the publication of a booklet on the natural history of the reserve, provided members of the Section undertook the compilation of it. A motion was carried that the Section undertake the work, which actually was already in hand and that the account include a short reference to the natural history of Morialta and Waterfall Gully reserves also. It was agreed that the booklet be issued in one part and that it be regarded as one or more numbers of the "South Australian Naturalist."

BIRD OBSERVERS' CLUB.

At the request of the Ornithological Association, Rev. H. A. Gunter and Mr. A. J. Wiley were appointed to confer with the above Association with regard to joint outings.

MARCH 19, 1935.

Chair: Rev. H. A. Gunter.

NOMINATION.

Miss L. M. Brown, 15 North Terrace, Highgate.

ELECTIONS.

Dr. H. E. Dunstone, Rev. J. J. Stolz, Misses M. and E. Stolz. Mr. H. T. Condon, Mrs. W. T. Hayward, and Mr. and Mrs. R. Cramond.

LANTERN LECTURE.

Mr. N. B. Tindale lectured on "The Peopling of the Australian Region." In his usual able manner, Mr. Tindale explained the four invasions of the Australian and Pacific region by people who originated in Asia. The lantern slides helped wonderfully in elucidating the points expounded by the lecturer.

APRIL 16, 1935.

Chair: Rev. H. A. Gunter.

ELECTION.

Miss L. M. Brown.

NOMINATIONS.

Mr. J. H. McDonald, School House, Payneham; Mr. A. Humphreys, Public School, Payneham.

LANTERN LECTURE.

Dr. R. S. Rogers gave a most absorbingly interesting lecture on Orchids and R. D. Fitzgerald, the Australian Orchidologist. It was a delightful talk that the Doctor gave and it is to be regretted that no verbatim report of it was made. Fine slides were shown including some original unpublished plates by Fitzgerald.

PAPER.

Rev. M. T. Winkler read a paper entitled "The World of Plants at Your Back Door." The paper dealt with plants one meets with every day, in the garden, the street, or parklands. Thus beauty was seen in weeds and many of them were mentioned in an interesting way.

EXHIBITS.

By Miss E. A. Harwood, opal chips from White Cliffs; rubies from Macdonnell Ranges collected by C. Winnecke; and gem sand from Port Noarlunga.

By Mr. E. H. Ising, flowering specimen of the hyacinth orchid (*Dipodium punctatum*); an album of pressed orchids and some crude and cured rubber from Malay States.

MAY 21, 1935.

Chair: Col. D. Fulton.

ELECTIONS.

Mr. J. H. McDonald and Mr. A. Humphreys.

PAPER.

Mr. W. H. Briggs read a paper entitled "Little Things that Matter," and he touched upon numerous subjects in the realm of nature, microscopic units in size, but which play a big part in the world of beauty, health and economy. Mr. Briggs showed a number of drawings and specimens to illustrate his paper.

EXHIBITS.

By Mr. E. Stansfield, Earshaped sponge, seahorse, fossil chiton attached to egg-shaped stone, sandstone in shape of mushroom.

By Rev. M. T. Winkler, Indian arrow heads.

By Mr. A. J. Wiley, native string of beads, rabbit fur string spun by natives; also goat hair string.

By Mr. E. H. Ising, Banksia flowers, native pear (*Xylomelum*) and *Hakea platysperma* sent by Mr. H. Beames, Kalgoorlie, W.A.

By Messrs. R. Bennett and W. A. Harding, microscopes and slides of interesting material.

ANNUAL MEETING.

The Annual Meeting of the Section will be held on Tuesday, August 20th., at 8 o'clock. The President, the Rev. H. A. Gunter, will deliver an address, and Mr. Wm. Ham will speak on "The Toll of the Years." The meeting will be held in the Society's rooms.

DONATION.

Dr. W. G. Torr, of Brighton, has kindly sent along one guinea as a gift towards the publication of the part in this

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It is with deep regret that we have to record the death by accident, of Mr. G. F. Hussey, a foundation member of the Society.

THE SPIDER AND THE FISH.

By Alfred E. Wadey, *S.A. Aquarium Society.*
(Communicated by Herbert M. Hale).

In one of the fish ponds at my home near Adelaide, a flat rock juts over the water for about six inches; the underside of this rock is approximately half an inch above the surface. Early in February, 1935, I saw a mass of spider web over and around the rock but did not take much notice of it at the time. A few days later, however, when looking at this pond, I noticed a considerable splashing in the neighbourhood of the web. On invesigation I then discovered a red goldfish, with a body two and a half to three inches in length, trapped in the web and with a large black spider on its back. The fish was still alive and vigorous, but on removing it and the spider with a net, I found that the spider had bitten a piece out of the back of the fish, about the size of a sixpence. Naturally the fish died (so did the spider—with my boot).

Has anyone in Australia had a similar experience, viz., of spiders catching fish with their web?

I told Mr. H. M. Hale (Director of the South Australian Museum) of this happening, and he at once expressed regret that I had not saved both fish and spider. Then a week later (on February 10) I found, to my disgust, a second fish being eaten in my pond by the same kind of black spider! In this case only a few strands of web were present. The fish was three inches or so in length and it and the spider were sent to the Museum, where the photograph, here reproduced, was secured. The hole in the back, behind the head, may be clearly seen, and the picture also shows the size of the fish as compared to that of the spider. A.E.W.

The notes furnished by Mr. Wadey are of unusual interest and apparently represent the first recorded occurrences of such attacks in Australia. Both goldfish, it may be noticed, were bulky, semi-spherical, "fancy" fish.

The late Dr. Robert H. Pulleine has identified the female spider submitted as a species of *Dolomedes*.

Only two other cases of spiders destroying fish seem to have been recorded: both are American and are quoted in Dr. McCook's "American Spiders and their Spinningwork." In the one, the observer (Mr. E. A. Spring, of Eagleswood, N.J.), "while walking with a friend in a swampy wood, which was pierced by a dyke three feet wide, was attracted by the extraordinary movements of a large black spider in the middle of the ditch. Closer

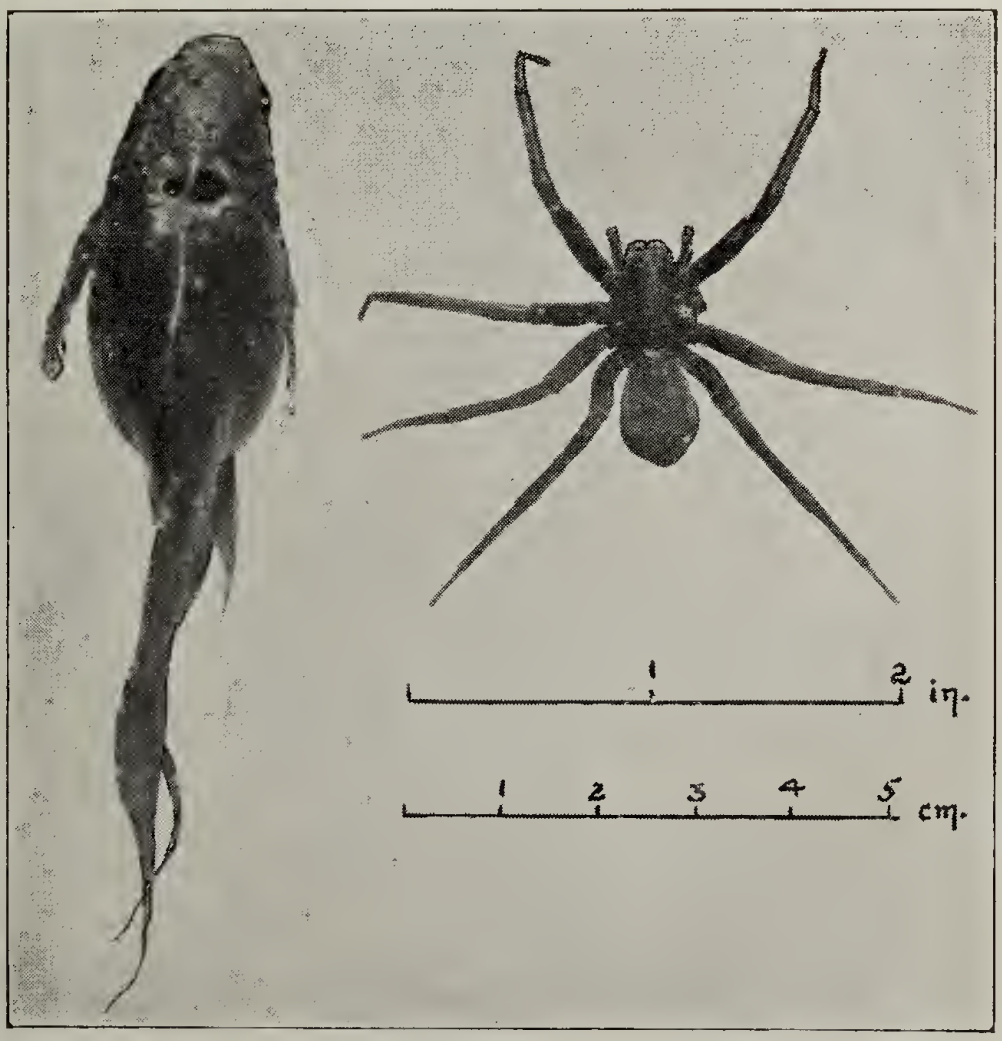


PLATE I.

observation showed that the creature had caught a fish. She had fastened upon it with a deadly grip just on the forward side of the dorsal fin and the poor fish was swimming round and round slowly, or twisting its body as if in pain. The head of its black enemy was sometimes pulled under water, but the strength of the fish would not permit an entire submersion. It moved its fins as if exhausted and often rested. Finally it swam under a floating leaf near the shore and made a vain effort to dislodge the spider by scraping against the underside of the leaf.

The two had now closely approached the bank. Suddenly the long black legs of the spider emerged from the water and the hinder ones reached out and fastened upon the irregularities of the side of the ditch. The spider commenced tugging at its prize in order to land it. The observer ran to the nearest house for a wide-mouthed bottle, leaving his friend to watch the struggle. During the interval of six or eight minutes' absence, the spider had drawn the fish entirely out of the water; then both creatures had fallen in again, the bank being nearly perpendicular. There followed a great struggle, and on Mr. Spring's return the fish was already hoisted head first more than half its length out upon the land. It was very much exhausted, hardly making any movement and was being slowly and steadily drawn up by the spider, who had evidently gained the victory. She had not once quit her hold during the period of a quarter to half an hour of observation. Her head was directed towards the fish's tail; she stepped backwards up an elevation of forty-five degrees, drawing her captive with her."

"The spider referred to may have been an example of *Lycosa lenta* or *L. fatifera*, or more probably *Dolomedes tenebrosus*, all of which grow to great size along streams of water."

The other instance was recorded by Mr. F. R. Welsh, of Philadelphia, who wrote that "a spider once killed two sunfish, each about two inches long, that he had in a basin in his room. After having attacked the first fish it ran over the water and fastened upon the second, which was also at the time, apparently well and vigorous. Mr. Welsh drove the spider off, but the fishes died in a few hours. Mr. Welsh could not identify the spider, and could describe it only in a general way; but judging from the figures in my books he supposed it might have been either a *Dolomedes* or *Agalena naevia*."

—H. M. H.

SOUTH AUSTRALIAN SHELLS.

(Including description of New Genera and Species).

(*By* Bernard C. Cotton & F. K. Godfrey).

PART XV.

TROCHIDAE (contd.)

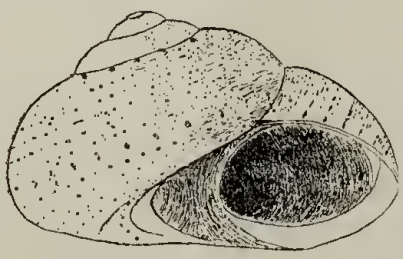
Gibbula Risso 1826. Shell conoidal, umbilicate, rather solid; spire moderately elevated; whorls frequently tuberculate above and with channeled suture; smooth or spirally ribbed; last whorl generally angular at the periphery; aperture subrhomboidal; columella oblique, dentate or subsinuous at the base; outer lip acute. Type—*G. magus* Linné. Many species which are nearly all littoral or laminarian in station. All seas, except upon the coasts of America, which have not a single species.

Gibbula ocellina Hedley 1911 (*Gibbula*). "The Eye-like Gibbula." Solid, imperforate, conical, with gradate spire, prominently keeled at the periphery and again at the shoulder; below the periphery, uniform buff colour, above it, broad, radial stripes of buff pink, alternate with white; along the periphery

Gibbula ocellina Hedley x 9.

are pairs of dashes of madder-brown, sometimes these enclose a tinted space and have a background of opaque white, thus assuming an ocellated aspect; protoconch pink; whorls five; base with seven flat evenly spaced concentric riblets; a strong revolving cord defines the periphery and ascends the spire; the last and penultimate whorls have four spiral riblets above the periphery, the uppermost stronger and forming the angle of a subsutural shelf; upper whorls smooth; aperture round, outer lip simple, dentate by the spirals; columella perpendicular. Height 3 diam. 3 mm. (Type locality—Several specimens from 100 fathoms, forty miles south of Cape Wiles, South Australia).

Gibbula reedi Verco 1907 (not *Gibbula fesserula* Tenison-Woods, an immature *Chlorodiloma adelaidae* Philippi). Solid, depressed conoid; chestnut-brown, with dark brown spiral hair-lines of varying width, dotted with tiny white spots, which, below the suture, are aggregated into small pyramidal blotches with their apex upward, six in the body whorl; a white band encircles the periphery; an articulated white-and-brown spiral borders the umbilicus, a second lies just outside this and another with more distant double white spots beyond; the rest of the base which is of a lighter tint than the dorsum, has scattered

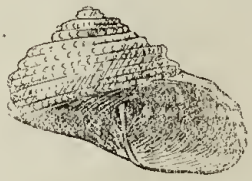


Gibbula reedi Verco x 6 (after Pulleine)

tiny white dots; umbilicus white, over all is a transparent glaze, with a bronze reflex; dorsum smooth except for very fine accremental scratchings; base with about a dozen fine spiral incisions, with radial scratch-marks which are stouter and wrinkling within and near the umbilicus; and an inconspicuous lira borders the umbilicus, which has a shallow groove just above it; whorls four, smooth, flatly convex, slightly hollowed just below the suture which is impressed; periphery round, barely angulate; base convex; umbilicus moderate; aperture oblique, roundly elliptical; outer lip simple, bevelled inside; columella arcuate, everted posteriorly, with a tiny notch where it joins the round basal lip at the end of the bordering lira of the umbilicus; throat smooth and iridescent. Height 3 diam. 6.2 mm. Beach, Holdfast Bay (Type locality), also Corny Point, Levens' Beach, Edithburgh. Not common. (Holotype Reg. No. D 9543 S.A. Mus.). A littoral species. Verco did not dredge it. There may be a faint gutter where the labrum joins the body whorl; the colour may be dark brown; the peripheral white band may fade out toward the aperture; the white blotches beneath the suture and the articulated bands around the perforation seem the most constant ornament. Named after Mr. Walter Reed, a keen South Australian collector who dredged in S.A. as far back as 1896.

Gibbula corallina sp. nov. "The Coral-red Gibbula." Shell turbinate, depressed, umbilicate; coral-red above, base creamy white; whorls rounded, periphery angulated; sculptured

with seven spiral lirae including the peripheral, alternate ones larger, granulated; sublenticular very slightly oblique radial striae; eight basal equal cords; sutures open canaliculate; colu-



Gibbula corallina sp. nov. x 8.

mella only slightly curved; umbilicus narrow and like that of *G. coxi* Angas (Verco MS). Holotype, height 3 diam. 3.3 mm. Locality, Gulf St. Vincent, with two paratypes. (Reg. No. D 11435 S.A. Mus.) A species quite distinct from any other Australian form. Sir Joseph Verco had four examples (now in the S.A. Museum) labelled "*corallina* sp. nov.," together with his description as above; also noting that he had received the shells from Dr. Basedow, locality, Gulf St. Vincent. It is not stated whether they were beach gathered or dredged. We have no other records and would like to hear from collectors who have taken it.

Notogibbula Iredale 1924 (Subgenus). Moderately umbilicated; whorls angular, with two prominent keels; finely spirally ridged and decussated with exceedingly fine and close oblique longitudinal lines; base finely concentrically ridged. Type—*Gibbula coxi* Angas.

Gibbula coxi Angas 1867 (*Gibbula*). Orbicularly conical, moderately umbilicated, rather solid; whitish, marbled with olive and pink, and with a few broad pure white flames descending from the sutures and interrupted on the keels with brownish red; base reticulated with gray and minutely spotted with red; spire conical; whorls five, angular, with two prominent keels, one next the suture; concave between the suture and upper keel, and a little concave between the keels; finely spirally ridged and decussated with exceedingly fine and close oblique longitudinal lines; base convex, finely concentrically ridged and decussated like the whorls, the ridges increasing in size towards the umbilicus. Height 8 diam. 10 mm. Not common, beach—St.

Gibbula coxi Angas x 3.

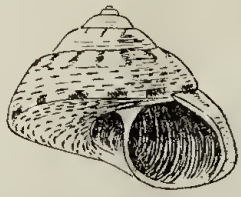
Francis Island. Dredged alive—Yankalilla Bay; off Troubridge Island; Investigator Straits; Backstairs Passage; 13 to 22 fathoms. Also Western Australia—Beach, Albany, Yallingup. Dredged—King George Sound, 35 fathoms, one example. (Type locality—Port Jackson). Varies much in colouring. The foot of the animal is nearly as long as the diameter of the base of the shell, about one third as wide, and rather pointed posteriorly. It is opalescent white in colour with an opaque white dotted margin. Two obscure purple blotches are seen through it on either side. The tentacles are as long as the foot is wide, white, with black eyes on the outer edge of their bases. Two long cilia are visible.

Gibbula preissiana Philippi 1848 (*Trochus*) (= *Gibbula porcellana* A. Adams 1851: = *G. weldii* Tenison-Woods 1877). Orbicular-depressed, rather thick, deeply umbilicated; whitish with conspicuous flexuous rosy-brownish lines and remote spots at the suture and periphery; first whorls smooth, the following spirally, delicately sulcate, with an elevated ridge in the middle; last whorl bicingulate, the cinguli elevated, distant; whorls five to five-and-a-half, separated by profound sutures; base convex, concentrically lirate, the lirae larger around the umbilicus; umbilical area sulcate and funiculate within; aperture subrotund; columella arcuate, not dentate. Height 6 diam 7 mm. Not

Gibbula preissiana Philippi x 3½. Radula on right.

common. Beach, Grange, Port Willunga, Kangaroo Island, and westward to Pondalowie Bay, Venus Bay, St. Francis Island. Also Western Australia—Beach, Albany to Bunbury. (Type locality—Gulf St. Vincent). Radula formula ∝ 1. (5.1.5)1. ∝. Very fine and threadlike. Of the central teeth the middle one is broad and has a flange on each side of its base, the rest have each one cusp with a fine serrated edge and a single flange on its outer side; the outermost differs slightly from its fellows. The single lateral is small and simple. The marginals have long narrow bases and two cusps, of which the larger has a serrated edge.

Gibbula lehmanni Menke 1843 (*Turbo*) (= *Gibbula pulchra* A. Adams 1851: not *Trochus lehmanni* Kiener). Umbilicate, roundly conical; white and reddish tessellated; whorls five to six, the first eroded, the following angular, flattened above, gradate, strikingly painted, spirally lirate, lirae delicate, about twelve on the penultimate whorl; last whorl dilated, biangular, with transverse white and reddish-violet interrupted lines, like flexuous rays; at the impressed suture and periphery there are



Gibbula lehmanni Menke x 3.

zones of violet-brown spots alternating with white or yellowish ones; base convex, with fifteen to sixteen concentric lirae; aperture subovate, margins thin; columella arcuate, subnodose inside below; umbilical tract white, funnel shaped. Height 7.5 diam. 9 mm. Specimen figured 7 x 9 mm. Dredged—Wallaroo, Investigator Straits, Thorny Passage, south of Tunk Head, 14-25 fathoms. Also Western Australia—Cottesloe beach; and dredged —King George Sound, Bunbury, 12-22 fathoms. (Type locality—Western Australian coasts. We designate Cottesloe W.A.) *G. coxi* Angas, is more solid, less depressed, more excavated between the carinae, spiral lirae sharper; coloration different, radial flames much fewer, elsewhere spotted rather than spirally articulated, irregularly stippled, fewer colours in the same shell.

Fossarina Adams & Angas 1863. Shell auriform, depressed, narrowly umbilicate; spire short; aperture oval, large, oblique; interior porcellanous, somewhat iridescent; peristome continuous. Operculum horny, multispiral, closing the aperture completely. Type—*F. patula* Adams & Angas. Dentition resembles that of *Cantharidus*. Distribution—Australasia.

Minopa Iredale 1924 (Subgenus). Depressedly globose, thin, smooth, shining, spire minute, suture much impressed, aperture lunate. Type—*F. legrandi* Petterd.

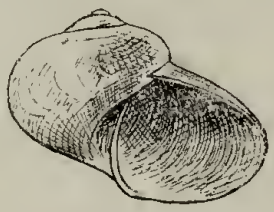
Fossarina legrandi Petterd 1879 (*Fossarina*). Depressedly globose, polished, translucent, rich brown; spire minute, very little elevated; whorls three-and-a-half, suture much impressed; aperture inflately lunate, tinged white and faintly dilate at the inner portion. Height 2 diam. 2.5 mm. South-east of South

Australia in shell sand, also St. Francis Island. Lives amongst seaweed on rocks. (Type locality—Circular Head, Tasmania, and King Island). Resembles *F. petterdi* Crosse, but the coloration and extreme polish are different. This species presents considerable resemblance to immature *Austrocochlea odontis* Wood, but the latter has spiral incisions, balances itself on its umbilicus (*G. legrandi* rests firm on its aperture), has a larger

Fossarina legrandi Petterd x 30.

umbilicus and the columella is not so expanded and does not cover it so much. As the shell lies on its dorsum, one does not look so fully into the mouth of *A. odontis*.

Fossarina petterdi Crosse 1870 (= *F. simsoni* Tenison-Woods 1876). Obliquely depressedly globose, umbilicus somewhat covered, thin, white, smooth, shining, undulately reddish-brown spotted; spire plano-convex, scarcely elevated; whorls four, very finely and closely striate lengthwise; last whorl much



Fossarina petterdi Crosse x 20.

expanded; aperture rounded; outer lip simple; inner lip arcuate, dilated posteriorly and produced into a kind of channeled triangular elevation. Height 6 diam. 9 mm. S.A. speciment illustrated, height 3 diam. 4.5 mm. Uncommon, beach, Glenelg, Henley, St. Francis Island. (Type locality—Long Bay, Bruni Island, Tasmania).

Nanula Thiele. Small, thin, globose-turbinate, umbilicate; whorls convex, rounded; spiral lirulae, regular, fine; last whorl large; aperture oblique; outer lip simple, thin. Genotype—*Gibbula tasmanica* Petterd.

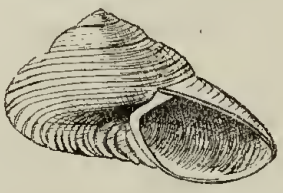
Nanula flindersi sp. nov. Shell small, narrowly umbilicate, turbinate, rather thin, dull; yellowish, flecked with light brown maculations which tend to form indefinite radial stripes, and

are more pronounced on the periphery; spire very short, sutures impressed; whorls four-and-a-half, rounded, sculptured with spiral lirae which are close and weak; last whorl rounded at the

Nanula flindersi sp. nov. x 6.

periphery; basal lirae more distant; aperture oval, outer lip simple, columella regularly concave; umbilicus very narrow. Holotype, height 3.75 diam 3.8 mm. Locality—Gulf St. Vincent, dredged 6 fathoms. (Reg. No. D 11433 S.A. Mus.) Also dredged, Beachport, 40 and 150 fathoms; Cape Borda, 62 fathoms; St. Francis Island, beach and dredged from 6 fathoms. West Australia—Bunbury, 10 fathoms. The South Australian shell differs from *G. tasmanica* Petterd, (type locality, Brown River, Tasmania) in being smaller and more depressed; the spire is much smaller and shorter in comparison with the body whorl.

Nanula galbina Hedley & May 1908. Galbina signifies greenish-yellow. Depressed-turbinate, broadly umbilicate, translucent, glossy; colour variable, either uniform, buff, uniform white, or brown spirals on a white ground; whorls four-and-a-half, rounded base, subangled periphery, flattened above and impressed at the suture; protoconch smooth, then two spiral keels increasing by intercalation to many close fine spirals on the last whorl, though they decrease in relative importance; growth lines



Nanula galbina Hedley & May x 5.

faint; aperture oblique, angled above, rounded below; outer lip simple; columella expanded; umbilicus deep, narrow, spiral, externally funicular. Height 5.5 diam. 7 mm. Several specimens, dredged—Beachport 110 fathoms, Cape Jaffa 130 fathoms. (Type locality—Port Kembla, N.S.W., 63-75 fathoms). The species is nearest to *G. flindersi* Cotton & Godfrey of which it may be regarded as the deep water representative. *G. galbina* is thinner,

larger, proportionately lower and broader, and more widely umbilicate. A specimen of *G. galbina* was taken by the "Thetis" in 63-75 fathoms of Port Kembla, N.S.W., but was catalogued by Hedley (Aust. Mus. Mem. 10, 1903, p. 334) as *G. tasmanica* Petterd.

WILD FLOWER SHOW
and Natural History Exhibition.
STOW HALL, FLINDERS STREET, ADELAIDE.
Friday and Saturday, October 12 and 13, 1934.

As the Town Hall was not available, the Show was held in the Stow Hall. The visit of the Duke of Gloucester proved a great counter-attraction, and the attendance was consequently much below that of former years and the financial results were correspondingly low. For the first time in the history of our Society there was a small debit balance.

The exhibits were quite on a par with those of former years and the many branches of natural history were fully represented. In particular, collections of native flowers from all the other States but Tasmania were on exhibition.

The band of faithful workers who toiled so hard to make the exhibition a success included so many of our number that it is impossible to thank them individually. Each of the 30 sections of the Show had enthusiastic members working willingly and it is most regrettable that visitors were attracted elsewhere.

The decoration of the Hall and general display was a great credit to the ladies who undertook the task. The exhibits of native flowers from the schools were equal to those of former years, the prize-winners being:—1: Basket Range; 2: Yeelanna; 3: Kuitpo; 4: Aldgate; 5: Nadda; and 6 Myponga. To these schools books have been sent as prizes.

Mr. Black, with Mr. Colquhoun, kindly judged the exhibits. Other Sections that may be mentioned were the Cultivated Native Flowers in which Messrs. Burdett and Ashby showed collections of immense variety; the Agricultural Exhibits by the Agricultural College and Wait Institute; the Insect Collections, shown by Mr. Womersley, of the Museum and the Aboriginal exhibits by Mr. Tindale, from the Museum; collections of Shells shown by the Malacological Society, and explained by various members, including Messrs. Kimber, Godfrey and Cotton.. Mr. Kimber, Prof. Harvey Johnston and Dr. Woods gave interesting lectures.

Space will not permit of even noting the many other classes of exhibits.

SOME SOUTH AUSTRALIAN SKIPPER BUTTERFLIES (Family Hesperidae)

By M. W. Mules.

Our South Australian Skippers constitute an interesting group of butterflies. They have been somewhat neglected as regards systematic collecting, but, indeed, this may be said of all our butterflies. Our collectors are very few in South Australia, and it is to be hoped that in the future we will see more collecting done here. Several species and races are confined to this State, and there may be some interesting discoveries made when we work out the life histories of some of the species about which, at the present time, little is known.

Skippers are rather unattractive in coloration, none of the species in South Australia being at all brilliant as compared with members of some of our other families of butterflies.

Hesperilla donnysa diluta Waterhouse, 1927.

This Skipper has been recorded from the Mt. Lofty ranges, Goolwa, Pt. Lincoln and Second Valley; one specimen is recorded from Adelaide. The larvae feed on the Swordgrass *Gahnia psittacorum*, which is found in damp gullies in the Adelaide Hills, and in the swamps around Second Valley and Yankalilla. It is pale green, with a hard light-brown head which bears a dark-brown V-shaped mark in front, and short dark marks on the side. The larvae form shelters by drawing two leaves of the swordgrass together and lining the tube with silk; the shelter is open at both ends. It is slightly narrower at the bottom than at the top. These shelters are made near the tips of the leaves, quite often the leaves are eaten off at the top of the shelter. Larvae or pupae may be seen without opening the shelter. They commence to pupate early in October; pupae are shiny black, occasionally light olive-brown; the pupal cap is divided into five sections or raised platforms. Butterflies start to emerge early in November. They may be found, in most cases, close to the food plant. This species rarely wanders far, but is a strong, fast flier. The shelters are often raided by birds and the pupae taken. About 5 per cent. of the pupae I have bred have been parasitised by flies.

Hesperilla idothea clara Waterhouse, 1932.

This very fine Skipper is much rarer than *H. donnysa*, and is confined to the Mt. Lofty Ranges. No females were known until last year, when I was able to breed several specimens. The food plant is *Gahnia psittacorum*. The larvae are similar to *H. donnysa* but are slightly larger and more robust. The habits of this species are quite different from *H. donnysa* in that they make their shelters at the base of the leaves and make

a perfect tube about two-and-a-half inches long by drawing the edges of a single leaf together and lining it with silk. Larvae start to pupate about the end of October. The pupae are pale green; the pupal cap has five raised platforms which are black. They are much smaller than in *H. donnysa.* About 25 per cent. of the pupae I have had have been parasitised. Butterflies emerge late in November. I have not seen them on the wing, but they should be taken in some of the wet gulleys in the hills where the swordgrass grows.

Hesperilla chrysotricha cyclospila Meyrick & Lower, 1902.

This butterfly is rare in South Australia. More specimens are wanted to compare with Victorian examples; Melbourne is the type locality. Slight differences are noticeable and when more example are available it is likely they will be found to constitute a new race. I have seen specimens from Port Lincoln and found one pupae at Second Valley. No specimens have been recorded from the Mt. Lofty Ranges. I consider it likely that this butterfly will be found in the Mt. Lofty Ranges and also in other parts where *Gahnia* grows. The food plant is *Gahnia psittacorum.* The larvae make their shelters by rolling two leaves in a spiral manner to form a cylinder about 3 inches long, lined with silk. The pupae lie head upwards and have a silken pad over them. This is the only Skipper pupa protected in this manner. It would be extremely interesting to find out how the butterfly emerges and escapes through the silken pad.

Motasingha dirphia trimaculata Tepper, 1882.

This fine insect is rare in South Australia; it occurs in the Mt. Lofty Ranges. I have seen the butterfly on the wing at Aldgate and have taken one pupa there in October. This emerged in November. I have also obtained one female example at Woodside. These butterflies are fast fliers and are difficult to net. Larvae feed on a short reed-like grass and form tubular shelters in the leaves; they pupate head upwards. Pupae are light-brown with the anterior end slightly hairy; the pupal cap has three raised platforms. The sexes of this Skipper were at one time considered to belong to different species, owing to the great difference in their appearance. Specimens have been taken at Belair, Blackwood, Port Victor and Port Lincoln in October and November.

Motasingha atralba atralba Tepper, 1882.

Recorded from Pt. Noarlunga and Ardrossan. The food plant is *Gahnia lanigera,* a very short plant with tough, wiry leaves; it grows along the edgs of the sea cliffs, and in exposed and desolate places. The larvae form tubular shelters and pu-

pate head downwards. Butterflies emerge in the autumn. Most of the specimens have been taken during April. It is thought that there may a spring brood, but so far this has not been definitely established.

Trapezites luteus luteus Tepper, 1882.

This is an extremely rare butterfly in South Australia; one male was recorded from Port Lincoln and two from Stonyfell. As the life history is not known, it is desirable that collectors keep a sharp look-out for the species during the summer months.

Trapezites phigalia Hewitson, 1868.

Found in the Mt. Lofty Ranges; I caught ten specimens at Woodside on November 9th of last year. On sunny days these Skippers appear to favor the hill tops and may be captured with considerable ease.

Anisynta cynone cynone Hewitson, 1874.

Found along the southern coast of this State, more commonly at the Murray Mouth; the food plant and life history of this species is not known; the imagines may be found during autumn.

Ocybadistes walkeri hypochlora Lower, 1911.

This small Skipper is found fairly commonly at Adelaide in the summer months and may often be seen settled on garden flowers.

Taractrocera papyria papyria Boisduval, 1832.

A very common little butterfly in and around Adelaide during the months of March and April. The larvae feed on ordinary grasses.

For notes on the systematic names of the South Australian Skippers, and references to other papers, the interested reader is referred to the following works:—

Waterhouse, A. G., and Lyell, G.: Butterflies of Australia, Sydney, 1914.

Waterhouse, A.G.: What Butterfly is that? Sydney, 1932.

Waterhouse, A. G.: Australian Zoologist, vii, 1932, pp. 198-201.

Waterhouse, A. G.: Pro. Linn. Soc. N.S. Wales 52, 1927, pp. 275-283; 57, 1932, pp. 218-238.

The South Australian Museum has the largest series of South Australian butterflies and the second largest collection in Australia. It possesses type specimens of several of the Skippers mentioned in the above paper. It includes the material taken by E. Guest during the last twenty years of last century. Mr. Guest made many notes of the life histories of South Australian Lepidoptera but his journals, unfortunately, remain unpublished. The Museum collection also embraces the material collected by the late O. B. Lower as well as contributions from Messrs. F. A. Angel, N. B. Tindale, J. D. O. Wilson and many other naturalists.—(Ed.).

VOL. XVI., No. 4.

THE South Australian Naturalist

THE JOURNAL OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA AND OF THE SOUTH AUSTRALIAN AQUARIUM SOCIETY.

Editor: BERNARD C. COTTON.

The Author of each article is responsible for the facts and opinions recorded.

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EXCURSIONS.

April 3rd—Heathfield (Mr. P. Smith's). Train, 1.14 p.m. Flowers and Shrubs. Mr. P. Smith.
April 17th—Largs Bay. Train, 1.35 p.m. Shells. Mr. B. C. Cotton.
May 8th—Long Gully. Train, 1.14 p.m. Botany. Mr. W. H. Selway.
May 22nd—Joslin (Mr. W. J. Kimber's). Tram, 2 p.m. Shells. Mr. W. J. Kimber.
June 19th—Museum. Gate, 2 p.m. General. Mr. H. M. Hale.
July 3rd—Morialta. Tram, 2 p.m. Botany. Dr. J. B. Cleland.

EVENING MEETINGS.

April 20th—Shell Club Evening. Mr. B. C. Cotton, Chairman.
May 18th—"Forestry in Australia," Conservator of Forests, Mr. G. J. Rodger, B.Sc.
June 15th—Lecture by Director Botanic Gardens, Mr. H. Greaves.

July 20th—"Orchids," Curator of Parks and Gardens, Mr. A. S. Orehard.

August 17th—Annual Meeting.

The
South Australian Naturalist.

VOL. XVI. ADELAIDE, MARCH, 1937. No. 4

IN MEMORIAM.

WILLIAM HAM, who died on November 12th, 1936, just before reaching his 71st birthday, was one of the oldest and most enthusiastic members of the Field Naturalists of South Australia. Thoroughly scientific and modern in his outlook, he yet remained a naturalist of the old school; that is to say, his sympathies were wide enough to include a love of everything animate and inanimate associated with the world of out-of-doors. His love of the open air, and of rambles in the bush, field, and beach, dated back to his earliest boyhood and were continued up to the time of his last illness. Mr. Ham had an abiding love of his native land, of which he knew the greater part, having wandered afoot over the West Coast, Yorke Peninsula, the Mallee Lands, the South East, Kangaroo Island, and the hills and plains around Adelaide, with occasional trips into the arid north.

In 1890, he married Miss Janet Scandrett, of Kapunda, who survives him. His family consisted of two daughters: Una (Mrs. A. Randell), and Kathleen (Mrs. G. Draper).

The information he gained from the many friendships with naturalists and bushmen—for Mr. Ham was a man who made friends easily, and retained his friendships—this information was readily available for any enquirer into natural history. The characteristics which endeared Mr. Ham to his fellow naturalists were his genial and equable temperament, his readiness to take part in any suggested activity, and his unwearied desire to learn more and more of the secrets of nature. I have referred to Mr. Ham as a native of South Australia; actually he was born at sea in the "Lady Milton" on November 20th, 1865, two days before arrival at Adelaide.

Mr. Ham was one of the oldest members of the Field Naturalists, which society he joined in June 1911, and was for some years one of their most energetic secretaries. He held the position of Secretary from 1916 to 1919, taking the office of Vice-President in 1920, and that of President in 1922. He remained President for two years. He was an active worker in connection with the annual wild-flower show; and he took over the onerous duties of editor of "The Naturalist" in 1922, when that journal was but two years old, continuing as editor to 1932, with a further three years as co-editor. He was always willing to act as excursion leader or to deliver an address, his last being a lecture on Sea Urchins in 1936. He was also a valued member of the Royal Society, which he joined in 1922.

Mr. Ham gave practically 50 years of service to the Education Department of South Australia, entering as a pupil teacher at Wallaroo Mines in 1881, and carrying out valuable and efficient work until his retirement in 1931. He entered the Teachers College as a student in 1885, and afterwards acted as Assistant or Head Teacher at the following schools: Sturt Street, Kapunda, Kadina, Rhynie, Meadows, Mt. Pleasant, Clare, and Woodville. He was appointed Assistant Inspector of Schools in 1912, and so continued until 1920, when he was appointed Senior Lecturer at the Teachers College, a position he held until his retirement.

Those who have come in contact with teachers in lonely places throughout the length and breadth of the out-back districts of South Australia know that no lecturer exerted a more powerful and more pleasant influence on the young teachers than William Ham. His name is spoken of with reverence and affection by his old students throughout the State.

He held the Diploma of Economics at the University, and from time to time acted as part-time lecturer there, and took a prominent part in the activities of the Workers Educational Association, of which he was for some time President.

The causes of education and of natural history in South Australia are much poorer by the loss of a kindly and capable friend, a selfless and enthusiastic worker.

LIFE AT THE EDGE OF THE SEA.

By KEITH SHEARD

(Hon. Assist. in Zoology to the South Australian Museum).

Notes on the Collecting of Marine Invertebrates.

A glance through the research cabinets of the Australian Museums, shows that while amateur collectors, as opposed to the professional workers in the various groups, have played a large part in the building up of most of the collections, those representative of the Marine Invertebrates, excluding the Mollusca, are mainly due to well organised expeditions or to the efforts of very few staff workers. With the best will in the world, the collector brings his gatherings in to the Museum, or builds a series for himself, but because he is unaware of the wealth of life at the tide's edge and is ignorant of the habits of that teeming population, his collections are merely repetitions of a few of the most obvious forms.

The result of this is the literal fact that more is known of the invertebrate fauna of Antarctic seas than is known of the inhabitants of the reefs and tidal zones of our own land. Yet with very little coaxing, the rocks and sands and seaweeds can be induced to give up their secrets, secrets rich and rare enough to satisfy the most exacting.

The collecting methods themselves are simple, but like most simple methods, effective.

Their improvisation by the Director of the South Australian Museum (Mr. H. M. Hale), has resulted in very extensive additions to our knowledge of the coastal fauna.

The first step is to learn the lay-out of the littoral zones of life.

High up on the beach are the rows of decaying seaweed, homes of small amphipodan crustacea, the Talitrids. Lower, on the line of the tide, come Marine Worms, various Mollusca, scavenging Cumacea, Amphipods, and Isopods, with sometimes armies of small crabs. The rule seems to be that the sand must not be too hard or too soft with the grains neither too large nor too small, and there appears to be, even given this ideal beach, correlation between the shore life and type of weed on the sea bottom opposite.

Mr. B. C. Cotton and the writer visited the beaches between Outer Harbour and Marino and found that the hard packed sands flanked by Estuarine weed of a low iodine content, between the

Harbour and Semaphore, were practically barren, the moderately packed, more coarsely grained sands of Henley, where estuarine weed was still in evidence, gave only a small return; but from West Beach to Brighton, where the sands, although varying in texture and density, were flanked by weed rich in iodine, the life was abundant and varied.

Collecting further down the coast, Mr. H. M. Hale has found that granite sands, such as occur at Chiton Rocks, Port Elliot, etc., are barren, while the Miocene sands of Sellick's Beach are particularly fertile; a representative new Cumacean genus, *Gephyrocuma pala* Hale, a new Amphipod genus, *Urohaustorius halei* Sheard, together with new species of both orders were discovered, with Copepods, Ostracods and Marine Worms in bewildering variety.

On the rock edged shores come the reef zones. First, the *Hormosira* meadows, barely covered at average low tide, uncovered at the lowest, reputedly barren, but actually with a surprisingly large population, some members apparently permanent, Molluscs, Copepods, Amphipods, Isopods, Tanaids; and others transient, Crabs and Blennies. Further out are the smaller rock pools and more varied seaweeds, and here the real richness of sea life begins. Every crevice in the peaceful pools teems with life, every piece of seaweed, the sand on the bottom, the loose pieces of rock and the thin film of algae and sand they carry.

Lastly, for the low-tide collector, are the permanent pools at the edge of the reef, placid and empty of everything but some waving weed, an anenome or two, or a prickly sea urchin, but at a touch giving the material for many hours of thought and wonderment.

With these zones in mind you decide to explore. Necessary is: a bucket, a small spade, a little formalin, tubes or jars ready filled with spirit, some labels, an enamel dish, a strainer of muslin or butter cloth (a tin with the bottom out with the cloth held in place by a rubber band answers admirably), a coat with many pockets and an old pair of leather-soled shoes, a shelving beach flanked by a reef, a low tide, and a companion.

From the sea you half fill your bucket with water, and at the very tide's edge you scoop up three or four spades full of sand, tip them in the bucket and stir vigorously. Before the mixture has settled, it is decanted through the strainer, loose sand is carefully washed out, and the catch is ready, either for bottling in spirit and labelling, or for examination in sea water.

If a little water is poured into the enamel bowl and the strainer cloth washed in this, the various specimens very soon settle down to their normal affairs. The Crustaceans belong mainly to two Amphipodan genera *Urohaustorius* and *Exoediceros* —sand-diggers both. *Urohaustorius*, a little parchment ball of chitin with flattened antennae and a red spot on the hinder margin of the two rear legs—for all the world like the colour patches on some monkey rumps—*Exoediceros*, longer and more slender, with his rearmost legs longer than his body, which is speckled with dark chromatophores. Some Marine Worms will be there, and perhaps a few of those very small, exquisitely adapted tunnelling machines—the Cumacea, probably of the genus *Gephyrocuma* or *Picrocuma*.

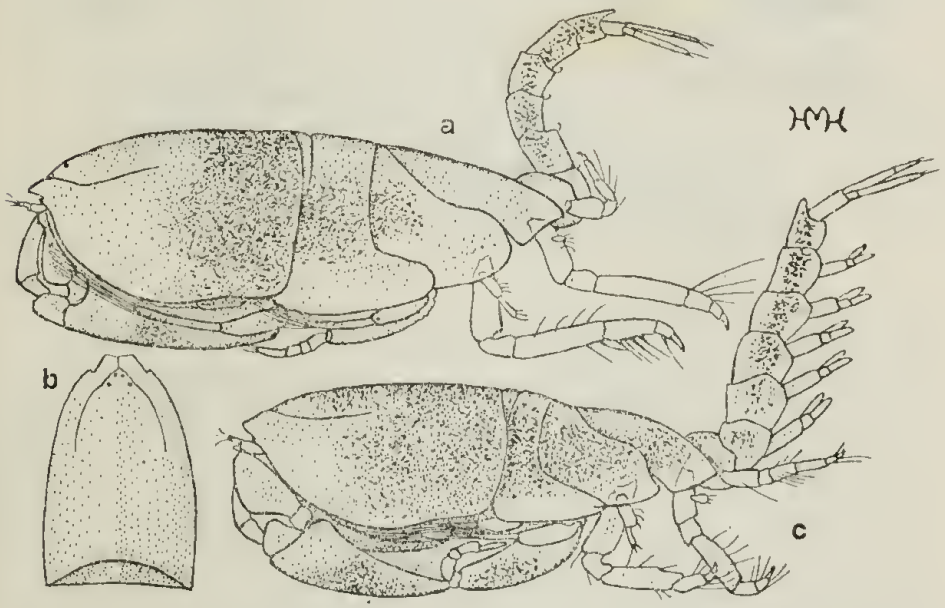


Fig. 1. *Gephyrocuma pala* Hale; *a*, female, *b*, dorsal view of carapace, *c*, male. (After Hale).

Exoediceros is seldom still, but skates madly, upside down, hanging to the under-surface of the surface film, suddenly diving every now and again to the bottom. *Urohaustorius* creeps on the enamel, his expanded antennae feverishly quivering and tapping as he tries to dig in. The worms unwisely wriggle, and advertise their presence, and promptly vanish into hungry crustacean stomachs.

If a little sand is dropped in the dish, the reason for the sudden diving of the *Exoediceros* is seen, the dive from the surface film with the long legs trailing behind is almost instantaneous and they are buried before the *Urohaustorius* have properly investigated their new home. In a short time all that is seen is sea-water and sand.

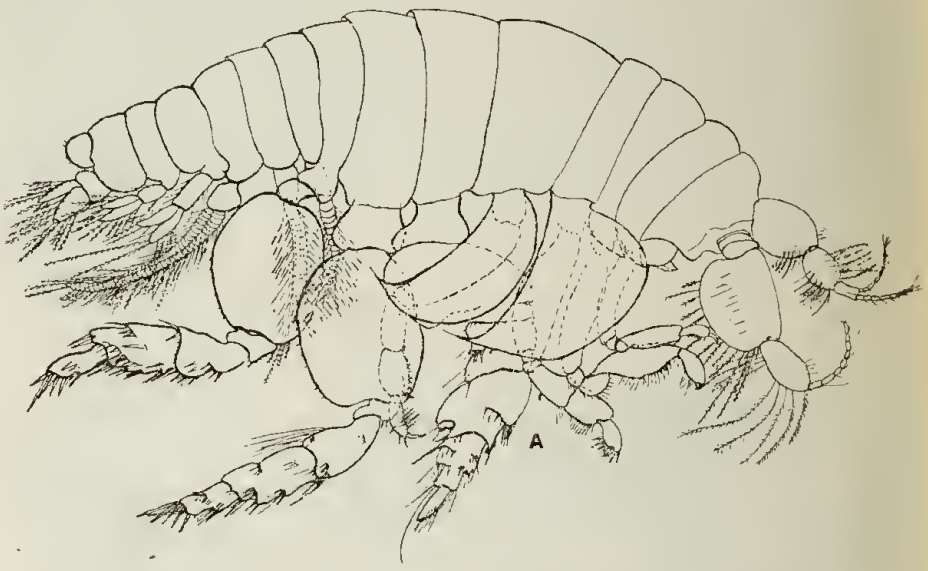


Fig. 2. *Urohaustorius halei* Sheard. (After Sheard).

Leaving the spade on the shore, you wade across the *Hormosira* to the rock pools. Here the bucket is filled with about three gallons of water to which about half a pint of formalin has been added, and into this alga-covered stones from the rock pools are placed. First, the Marine Worms pour from their tubes and crevices, followed by Amphipods, Isopods, Cumacea and larger Crustacea until, after about twenty minutes, these rocks are washed well, taken out, and replaced by others. When sufficient have been soaked, the water is strained through the butter cloth and the specimens straight-way transferred to spirit for future examination.

Seaweed may be treated in the same manner, clouds of small Crustacea crowding out from their home. Many of these forms are little known and present many problems to the zoologist.

In these weeds primitive, leaf-like Amphipods, the Phliantids, accompany their more specialised cousins, the Caprellids, weird skeletons which successfully imitate the seaweed strands; while Pycnogonida, whose eight legs and small body are strongly

reminiscent of spiders, may be seen, the male carrying the egg bundles on specialised joints of his legs. When to these are added the myriad Copepods and representatives of most of the Isopod groups, from the relatively huge Idoteids to Sphaeromids and Cirolanas, the total from one small pool is enough to convince you of the inexhaustible fertility of the sea.

Should you desire to study the animals living, the best method is to place a little water in the bowl and stand a rock or seaweed in this in the hot sun. Gradually the rock or weed will dry, and many of its inhabitants will creep to the damper side and may be shaken into the water, but it will be well to do this long before the tide begins to come in, as you will become so interested that you will find the water cutting you off before your collecting is half done, for there yet remain the under sides of such rocks as can be lifted.

If these are turned over in water so that after a while the animals begin to carry on their daily life again, you will see how the Anemones live, be able to watch finger-like Holothurians, and realise that each colouration represents a different animal or colony, from the blood-red Bryozoan, *Mucro*, to the translucent egg masses of any one of a number of groups.

By now the tide has fully turned, and you prepare to leave when your companion sees an octopus creeping from under the last rock that has been turned over. While he catches it, you turn back the rocks that have been disturbed (on the general principle of leaving things more or less as you find them), and by the time this is done the octopus, with many score of egg capsules held close to it, is caught, your companion refuses to pickle it, and you have the experience of seeing quite an acrobatic feat. Leaving you to pack the various impedimenta, he starts for the shore, balancing the enamel bowl, negotiating potholes and slippery places, and altogether giving a performance that neatly rounds off the day's experience.

The catch obtained from the three methods—straining of the shore sand, the formalin soaking, and the sun drying—may prove difficult to name, as obscure forms and new species are frequent but with the help of the British Science Guild Handbook, the Crustaceans of South Australia (H. M. Hale), papers on the Isopoda and Cumacea (H. M. Hale), and the Amphipoda (K. Sheard) in the Records of the South Australian Museum, the Crustacea may be fairly well identified. While for the rest, recourse may have to be made to a Museum specialist.

PLANTS OF THE ENCOUNTER BAY DISTRICT.

(a)—Fourth List of Additional Records.

By J. B. Cleland *and* J. M. Black.

We published a Third List of Additional Records in the "South Australian Naturalist" for May, 1932 (Vol. XIII., No. 3, page 118). Since then, a number of additional records have been obtained. The total number of species known for the district is now approximately 838 (excluding 18 varieties), of which 654 are native and 184 are introduced species. Some new localities are also included as well as certain corrections in nomenclature.

(Note.—"Upper Reservoir Swamp" is a very interesting swamp near the top of the hillside about 1½ miles west of the Cut Hill on the main road. It drains into the creek that supplies the Reservoir).

Polypodiaceae.—*Hypolepis rugulosa* (Labill.) J. Smith (=*Dryopteris punctata* (Thunb.) C. Chr.), in swamps, Upper Tunkalilla Creek.

Lycopodiaceae.—*Lycopodium laterale* R.Br., already recorded, Upper Reservoir Swamp.

Gramineae.—**Setaria verticillata* (L.) Beauv., in gardens, Victor Harbour, Goolwa, Jan. (previously recorded as *S. sp.).

**Ehrharta villosa* Schult.f. var. *maxima* Stapf, binding sand on railway line between Port Elliot and Victor Harbour, in sand Encounter Bay.

Dichelachne sciurea (R.Br.) Hook.f., forest between Inman Valley and Hindmarsh Tiers, Jan.

**Avena barbata* Brot.

Amphibromus Neesii Steud. replaces *A. nervosus* (R.Br.) Hook.f. already recorded.

Pappophorum nigricans R.Br., Black Heads, hill-side at Encounter Bay, Feb.

Cyperaceae.—*Schoenus brachyphyllus* F.v.M., already recorded; the pedicels are finely serrate, near Waitpinga road, small tussocks near Hall's Creek.

Schoenus deformis R.Br., on travertine limestone on Goolwa Road two miles from Middleton.

Heleocharis sphacelata R.Br., Upper Willow Creek.

Scirpus cernuus Vahl., already recorded, pond near Hall's Creek.

Cladium rubiginosum (Soland.) Domin, already recorded, Duck's Nest Creek in Inman Valley.

Restionaceae.—*Leptocarpus Brownii* Hook.f., recorded but later removed from the list, is found in damp sandy soil near Hall's Creek and at Upper Hindmarsh Valley.

Xyridaceae.—**Xyris operculata* Labill., already recorded, Upper Reservoir Swamp.

Iridaceae.—**Watsonia Meriana* Mill., Hall's Creek.

**Gladiolus cuspidatus* Jacq.

Liliaceae.—*Dianella laevis* R.Br., already recorded, flat near South Coast Hospital and Hindmarsh Valley, Jan.

Lomandra multiflora (R.Br.) J. Britten, Hall's Creek road, in flower, May.

Dichopogon fimbriatus (R.Br.) J. M. Black, already recorded, flat near South Coast Hospital, flowers sweet-scented, Jan.

Orchidaceae.—*Spiranthes australis* Lindl., flowers white, in several inches of water, Upper Reservoir Swamp, also at Mount Compass, Jan., 1934.

Proteaceae.—*Hakea vittata* R.Br., on travertine limestone two miles from Middleton on the Goolwa road.

H. ulicina var. *latifolia* J. M. Black, Encounter Bay, Goolwa Scrub.

Santalaceae.—The record of *Exorcarpus aphylla* is probably an error.

Chenopodiaceae.—**Chenopodium anthelminticum* L., prostrate on the strand, Encounter Bay.

Amaranthaceae.—**Amaranthus retroflexus* L., Victor Harbour.

Aizoaceae.—**Cryophytum crystallinum* (L.) N. E. Brown, Ice-plant, Middleton, Goolwa.

Portulacaceae.—*Calandrinia dipetala* J. M. Black, Encounter Bay in Black's Flora.

Caryophyllaceae.—**Tunica prolifera* (L.) Scop., Proliferous Pink, abundant on the neck of the Bluff, Nov.

Ranunculaceae.—*Ranunculus trichophyllus* Chaix, Water Buttercup, in water, Back Valley.

Papaveraceae.—**Fumitaria densiflora* DC., Middleton.

Cruciferae.—**Coronopus didymus* (L.) Sm.

**Diplotaxis tenuifolia* L. (DC.), Victor Harbour, Encounter Bay.

Hutchinsia procumbens (L.) Desv. Sea cliffs at the Bluff.

Droseraceae.—*Drosera binata* Labill., already recorded, Upper Reservoir Swamp.

Leguminosae.—*Daviesia corymbosa* Sm., already recorded, hill near Hall's Creek.

Pultenaea pedunculata Hook., already recorded, track across Upper Willow Creek, Jan.

P. quadricolor J. M. Black, already recorded, Upper Willow Creek, Jan.

P. teretifolia H. B. Williamson, already recorded for hills near Upper Willow Creek; the leaves have a slight aromatic scent.

**Cytisus canariensis* L., already recorded, Upper Hindmarsh Valley, Jan.

**Trifolium fragiferum* L. var. *pulchellum* Lange, Port Elliot (in Black's Flora).

**T. scabrum* L.

**Medicago confinis* Koch.

Geraniaceae.—**Geranium molle* L., Encounter Bay, Sep.

Oxalidaceae.—**Oxalis* sp., One O'Clock, hill on Waitpinga Road.

**O. flava* L., Victor Harbour, recorded by J. M. Black, Trs. Roy. Soc. S.A., LIX, 1935.

Rutaceae.—*Boronia Edwardsii* Benth., on a gravelly hill-top near Mount Scrub, Waitpinga, a colony in flower, Jan., 1933.

Dilleniaceae.—*Hibbertia Billardieri* F.v.M. should be var. *parviflora* (R.Br.), Bentl., also Upper Back Valley, Jan.

Guttiferae.—*Hypericum japonicum* Thunb., swamp, Upper Hindmarsh Valley, Jan.

**H. perforatum* L., one plant found at edge of scrub, Waitpinga, Jan. 1935.

Thymelaeaceae.—*Pimelea micrantha* F.v.M., Bluff, Jan.

P. phylicoides Meisn., already recorded, Hall's Creek, Jan.

Myrtaceae.—A very hairy form of *Calythrix tetragona* Labill. occurs near Hall's Creek, Jan.

Melaleuca squamea Labill., var. *glabra* Cheel., Upper Reservoir Swamp.

M. uncinata R.Br., already recorded, may still be found in sandy soil in vacant blocks in Victor Harbour itself.

Eucalyptus odorata F.v.M. var. *cajuputea* F.v.M., already recorded, road across Upper Willow Creek and near Goolwa.

E. cneorifolia DC., already recorded, common on gravelly hill-tops near Mount Scrub.

Halorrhagidaceae.—*Loudonia Behrii* Schl., Waitpinga near Mount Scrub, scrub near Goolwa.

Epacridaceae.—*Lissanthe strigosa* (Sm.) R.Br., road across Willow Creek, Waitpinga.

Acrotriche depressa R.Br., Native Currant, Hall's Creek, Goolwa scrub.

Loganiaceae.—*Mitrasacme paradoxa* R.Br., Hall's Creek, Oct.

Logania crassifolia R.Br. var. *minor* Black, already recorded, is common on travertine limestone on the Goolwa road 2 miles from Middleton.

L. linifolia Schl., already recorded, behind the sandhills between Victor Harbour and the Inman Mouth.

Borraginaceae.—*Halgania cyanea* Lindl., common on travertine limestone on the Goolwa road 2 miles from Middleton and in the Goolwa scrub, Nov. Dec. Jan.

**Echium plantagineum* L., Salvation Jane, a few plants at Victor Harbour.

**Linaria Elatine* (L.) Mill., should be var. *lasiopoda* Vis.

Scrophulariaceae.—**Mimulus moschatus* Dougl., Musk Mimulus, Zinc Corporation's Forest in Upper Hindmarsh Valley, Jan.

Veronica gracilis R.Br., Back Valley near swampy ground, Oct.

**V. arvensis* L., Back Valley.

Plantaginaceae.—**Plantago major* L., Greater Plantain. In creeks, Upper Hindmarsh Valley.

Campanulaceae.—*Wahlenbergia Sieberi* A. DC., and *W. multicaulis* Benth. replace *W. gracilis* DC. already recorded.

Goodeniaceae.—*Goodenia varia* R.Br., in Black's Flora.

Stylidiaceae.—*Stylidium perpusillum* Hook.f., Hall's Creek, Back Valley, Oct.

S. despectum R.Br., Back Valley, Oct.

Compositae.—*Olearia teretifolia* (Sond.) F.v.M., road across Willow Creek, Jan.

Cotula filifolia Thunb., cliffs west of Bluff, Aug.

C. australis Hook., already recorded, found near Hall's Creek.

Centipeda minima (L.) A.Br. et Aschers, Duck's Nest Creek in Inman Valley, Jan.

Stuartina Muelleri Sond., Hall's Creek, Oct.

Angianthus Preissianus (Steetz) Benth. Back Valley.

Helichrysum semipapposum DC. var. *brevifolium* Sond., Pt. Elliot (in Black's Flora), the typical form already recorded.

Helipterum australe (A. Gray) Druce, Bluff, Oct., Nov.

Introduced Species.—**Aster subulatus* Michx., Victor Harbour.

**Urospermum picroides* (L.) Desf., Bluff.

**Centaurea nigra* L., Inman Mouth (not really established).

**Scorzonera laciniata* L. Port Elliot, Dec.

The following additional records refer to the Goolwa Scrub and the neighbourhood of Goolwa:—

Santalaceae.—*Exocarpus spartea* R.Br.

Portulacaceae.—*Calandrinia pygmaea* F.v.M., already recorded.

Rosaceae.—**Poterium sanguisorba* L., Sheep's Burnet, abundant along the railway line between Currency Creek and Goolwa.

Leguminosae.—*Daviesia genistifolia* A. Cunn.

Acacia microcarpa F.v.M.

A. dodonaeifolia, already recorded, has established itself here.

Rutaceae.—*Boronia caerulescens* F.v.M.

Rhamnaceae.—*Spyridium eriocephalum* Fenzl.

Malvaceae.—*Plagianthus microphyllus* F.v.M., on salt flats.

Myrtaceae.—*Melaleuca acuminata* F.v.M.

Umbelliferae.—**Bupleurum semicompositum* L.

Epacridaceae.—*Acrotriche cordata* (Labill.) R.Br.

A. affinis DC., already recorded.

Brachyloma ciliatum (R.Br.) Benth.

B. ericoides (Schl.) Sond., already recorded.

Borraginaceae.—*Heliotropium europaeum* L., near the Murray.

**Lithospermum apulum* (L.) Vahl, Black Weed, in fields.

Goodeniaceae.—*Goodenia pinnatifida* Schl., on travertine limestone.

Compositae.—**Carthamus lanatus* L., Woolly Star Thistle, Goolwa sandhills.

Toxanthus Muelleri (Sond.) Benth.

(b)—The Goolwa Scrub and Surroundings of Goolwa.

By J. B. Cleland.

In an account of the plants of this district, we considered the area as extending from Tunkalilla Beach and road, thence round the ridge to the Bald Hills, thus embracing Inman Valley and Back Valley, across to Hindmarsh Tiers embracing the watershed of the Hindmarsh and then along the ridge from the Cut Hill to Middleton and the sea. To round off this district more completely, it seems advisable to add to this the area included

by passing from the Cut Hill on the Willunga Road along the ridge through Mr. Higgins' property and thence to Currency Creek to its junction with the Murray. This includes Goolwa and the peninsula on which it lies with the scrub between Currency Creek and Middleton. This additional area possesses botanical features differing somewhat from other parts of the Encounter Bay district and several plants occur here not recorded so far from the other portions.

Not much now remains of the once extensive scrub between Middleton, Goolwa and Currency Creek and eastwards to the Murray. What remains shows how rich in interesting species this scrub was. The country consists of a rather sandy soil, in places with much travertine limestone and in parts with depressions holding water in winter in which flourishes *Callistemon rugulosus* with its handsome deep red flowers. To the east the country rises somewhat to a sandy knoll overlooking the Murray, the west side of the knoll having a considerable growth of mallees and acacias.

In the travertine limestone areas, the rough-leaved sedge. *Gahnia deusta* is abundant, the smaller *G. lanigera* whose leaves are not serrated being less common. *Halgania cyanea* is also abundant on the limestone, its deep blue flowers presenting a showy appearance in October to December. In the sandy soil, prickly bushes of *Daviesia pectinata* are common, this species growing also near Newland's Head as well as in the Port Lincoln district. Other species met with and abundant are *Eucalyptus angulosa, E. fasciculosa, E. odorata* var. *cajuputea, Melaleuca uncinata, Hakea ulicina* var. *flexilis* and *Lomandra juncea;* scattered plants occur of *Acacia ligulata, A. armata, A. spinescens, A.* sp., *Melaleuca acuminata, Xanthorrhoea Tateana, Myoporum, Grevillea ilicifolia, G. lavandulacea, Banksia marginata, Hakea ulicina* var. *latifolia, H. rugosa, Bursaria spinosa, Thomasia petalocalyx, Daviesia brevifolia, D. genistifolia, Calythrix tetragona, Dodonaea Baueri, Cheiranthera linearis, Billardiera, Lomandra dura, L. glauca, Helichrysum Baxteri, H. leucopsidium, H. scorpioides* (?), *H. apiculatum, Spyridium eriocephalum, Linum marginale* (with rust), sheep's burnet abundant along the railway line, the grass *Neurachne alopecuroides* common, *Stipa* (several species) and *Clematis. Loranthus Exocarpi* is badly affecting some sheoaks (*Casuarina stricta*) on the knoll overlooking the Murray. Here also are several tufts of *Triodia irritans,* one measuring 10 ft. x 8 ft. x 6 ft. high. *Halgania cyanea* is common on travertine limestone. The minute succulent *Calandrinia pygmaea* grows in the sandy soil in spring.

RECORDS OF SNAILS AND SLUGS INTRODUCED TO SOUTH AUSTRALIA.

By Bernard C. Cotton.

Four species of European snails were recorded from South Australia by the late Sir Joseph Verco (Rec. S. Aust. Mus., Vol. II, No. 2, 1922, and No. 4, 1924) and since then nothing further has been published concerning introduced land species. The following notes show the present distribution of the four already recorded, and add two further species. Some of the species are already a pest here and in other parts of the world, while one, *Testacella halitoidea*, can be called at least harmless, if not beneficial. The purpose of this short account is to enable those interested to identify the species and record their spread.

Testacella haliotidea Draparnaud.

This carnivorous slug is a comparatively recent introduction, being first found in August, 1931, and taken at the Botanical Gardens, Adelaide. A brief note concerning the discovery was printed in the "News" on August 5th, 1931.

It is a native of South-west England. Voracious and gregarious, the carnivorous slug spends the larger part of the year burrowing in the ground in search of earth worms, and also attacks other snails and slugs. According to observation in my garden, it is most in evidence during September and August.

The local specimens are a dull cream colour and some attain to at least three and a half inches, and may be readily distinguished by the tapered anterior and wider posterior where the oblong, convex shell, covered with a brown periostracum, is situated.

Helicella caperata Montague.

(Plate 1, fig. 5, 6).

While sorting through unidentified shells in the Museum, a box of small land shells taken at Robe was discovered. With them was the following label: "Snails which cover the walls of the house in great numbers during the day. Taken by A. Tresize, Robe School, June 6th, 1912."

Six further specimens were taken from the walls of the obelisk, Robe, recently by the author. They prove to be the above species, which is said to be extremely common in Victorian gardens. The species is common in the British Isles and Europe.

A small brownish shell, with close set axial wrinkles and interruptedly banded. Diameter 12 mm., height 8 mm. All South Australian specimens so far examined have been juveniles of about 8 mm. x 5 mm.

Helicella ericetorum Muller.

(Plate 1, fig. 3, 4).

In 1924 Verco recorded this European species from various localities on Yorke Peninsula. It is now very common there and in places the low srub is so covered that the shells, at a distance, have the appearance of blossom. The shell is depressed, with a wide umbilicus, and a single chestnut or chocolate band encircles the body whorl at the periphery; other iess distinct spiral bands encircle the base. Diameter 15 mm., height 7 mm.

Euparypha pisana Muller.

(Plate 1, fig. 1, 2).

This species was taken by Mr. A. A. P. Cossels at Millicent, in December, 1923. Specimens were forwarded to the South Australian Museum with the information that they were "playing havoc" with the barley crops, and had only been seen in the disrtict for two or three years. It is widely distributed in England, Mediterranean Regions, North Africa, and has become a serious pest in South Africa and California. The species is now widely distributed in the South-east of South Australia, occurring at Beachport, Robe, and at Kingston in countless thousands "climbing trees and almost covering the fence posts" (Hale). It has recently been taken by Dr. C. Hackett at Prospect, in the metropolitan area of Adelaide. The breeding season here appears to be about March. Less depressed than the former species, milky white, with a whiter peripheral band, base light brown fading to white at the narrow umbilicus.

Cochlicella acuta Muller.

(Plate 1, fig. 7, 8).

Specimens first received at the South Australain Museum from Mount Gambier and were recorded as *Helicella* (*Cochlicella*) *ventricosa,* Draparnaud, by Verco in 1922. The species is widely distributed in England and the Mediterranean Region. It is now well distributed in the metropolitan area of Adelade, specimens having been procured in practically every suburb. We have also specimens from one suburb, Payneham, taken by Mrs. L. A. Elliott, which are typical of the variety *bizona* Moquin-Tandon, with the two characteristic dark bands on the last whorl. The shell is turreted much higher than wide, white with more or less distinct brown bands. Diameter 5 mm., height 15 mm. Evidently very prolific, and soon plentiful when introduced into gardens.

Helix aspersa Muller.

The species is all too plentiful, especially around cultivated areas. It is said to have been intentionally introduced to South Australia for some purpose. There is a perfect sinistral adult specimen in the South Australian Museum, taken locally.

EXPLANATION OF PLATE I.

Fig. 1—*Euparypha pisana* dorsum x 2.

Fig. 2— „ „ ventrum x 2.

Fig. 3—*Helicella ericetorum* Muller dorsum x 2.

Fig. 4— „ „ „ ventrum x 2.

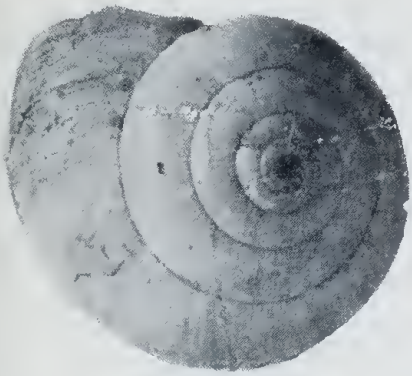
Fig. 5—*Helicella caperata* Montague dorsum x 2.

Fig. 6— „ „ „ ventrum x 2.

Fig. 7—*Cochlicella acuta* Muller x 2.

Fig. 8— „ „ „ var. *bizona* x 2.

PLATE I.



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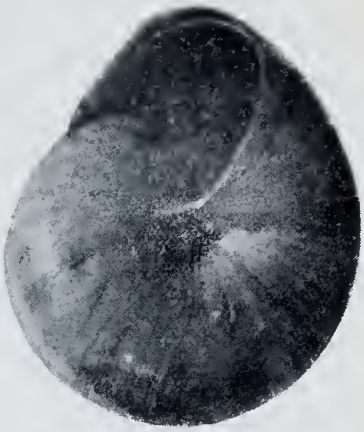

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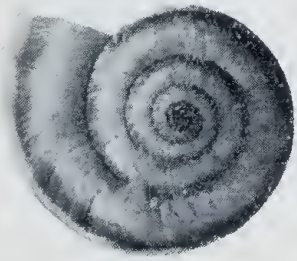

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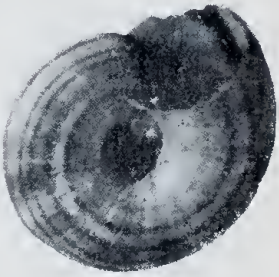

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